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RURAL SANITATION

A REPORT ON SPECIAL STUDIES MADE IN 15 COUNTIES IN 1914, 1915, AND 1916

By

L. L. LUMSDEN

PREPARED BY DIRECTION OF THE SURGEON GENERAL

~~J. G. Fitzgerald~~

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CONTENTS.

Page.
General discussion 7
The problem 8
  Diffuseness and difficulties 10
  Education essential to solution 11
  Importance 13
  Relation to urban health 16
  Principles involved 16
  Interstate scope 17
Plan of work 18
  General remarks 18
  Selection of counties 22
  Preliminary arrangements 23
  House-to-house canvass and survey 25
  Educational efforts 28
  Sanitary measures recommended at country homes 31
  Cooperation 32
  Laboratory investigations 33
  Investigation and bedside control of typhoid fever 33
  Towns and villages 34
  Follow-up visits 35
  Modifications 36
Direction of the work 38
Findings 39
  Some of the more salient conditions found 40
  Knowledge of sanitation 40
  Popular attitude toward sanitary measures suggested 42
Results 42
Summary 43
Conclusions 45

Berkeley County, W. Va 46
Lawrence County, Ind 61
Union County, Miss 75
Dorchester County, Md 86
Foreword on work in 1915 102
Anne Arundel County, Md 103
Wilson County, Kans 123
Orange County, N. C 140
Walker County, Ala 153
Dallas County, Iowa 169
Foreword on work in 1916 206
Greenville County, S. C 207
Floyd County, Ga 227
Tuscaloosa County, Ala 247
Obion County, Tenn 261
Clay County, Mo 280
Cumberland County, Ill 295

Appendix A. Sanitary ordinances adopted 304
Appendix B. Resolutions in regard to surveys 321
Appendix C. Story used in educational work 330

DETAILED TABLE OF CONTENTS.

Subject.[1]	Page on which subject is treated.														
	Berkeley Co., W. Va.	Lawrence Co., Ind.	Union Co., Miss.	Dorchester Co., Md.	Anne Arundle Co., Md.	Wilson Co., Kans.	Orange Co., N. C.	Walker Co., Ala.	Dallas Co., Iowa.	Greenville Co., S. C.	Floyd Co., Ga.	Tuscaloosa Co., Ala.	Obion Co., Tenn.	Clay Co., Mo.	Cumberland Co., Ill.
General conditions	46	61	75	86	103	123	140	153	169	207	227	247	261	280	295
Plan and scope of survey	47	62	76	87	104	125	141	154	171	208	228	247	262	281	296
Findings in rural sections	48	63	77	89	105	125	143	156	172	209	228	248	264	282	297
Popular attitude	.....	64	.....	.....	105	126	143	156	173	209	229	248	264	282	.....
Race, nationality	48	64	77	89	105	126	143	156	.....	209	228	248	264	283	297
Number persons in household	48	64	.....	.....	105	126	143	156	173	209	229	249	264	283	297
Number rooms to house	48	64	77	89	106	126	143	156	173	209	229	249	264	283	.....
Sale of food from homes	.....	.....	.....	.....	106	128	144	156	.....	209	229	.....	265	.....	.....
Appearance of homes	.....	64	77	89	106	126	144	.....	173	210	.....	249	.....	283	.....
Construction of houses	48	64	77	89	106	126	141	157	173	210	230	249	265	283	.....
Cleanliness of premises	49	64	77	89	106	126	144	157	173	210	230	249	265	233	.....
Cellar or basement	49	64	77	89	105	126	144	157	173	210	230	249	.....	283	.....
Screening in summer	49	65	77	89	105	126	144	157	174	210	230	249	265	283	297
Topography	49	65	77	.....	106	.....	144	157	174	.....	230	249	265	284	.....
Drainage from near-by premises	49	65	78	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Animals on premises	49	65	78	89	106	.....	144	157	174	.....	230	.....	265	284	.....
Stable manure	49	65	78	90	106	126	144	157	174	.....	230	.....	265	284	.....
Disposal human excreta	49	65	78	90	107	126	144	157	174	211	231	249	266	284	298
Water supply	49	66	78	90	107	127	145	158	175	210	230	249	265	284	298
Rural villages, industrial settlements	50	67	.....	.....	108	.....	.....	159	177	212	.....	.....	.....	.....	.....
Public places	50	67	79	90	110	128	145	159	177	211	231	250	266	285	298
Dairies, stores, etc.	.....	67	.....	91	110	.....	146	.....	.....	.....	231	.....	268	.....	.....
County health administration	51	68	.....	91	111	129	146	160	177	212	.....	250	268	286	.....
Sanitary rating	.....	68	.....	.....	.....	.....	145	160	178	211	232	.....	268	286	298
Findings in incorporated towns	51	68	80	92	117	129	146	160	180	215	232	251	268	286	299
Race	.....	.....	.....	92	.....	.....	.....	160	.....	.....	.....	.....	269	286	.....
Number persons in household	.....	.....	.....	.....	.....	.....	.....	161	.....	216	.....	.....	269	286	.....
Number rooms in house	.....	.....	.....	.....	.....	.....	.....	161	.....	216	.....	.....	.....	287	.....
Appearance of homes	.....	.....	.....	.....	.....	.....	.....	.....	.....	216	.....	.....	.....	286	.....
Construction of house	.....	.....	.....	.....	.....	.....	.....	161	.....	216	.....	.....	.....	286	.....
General cleanliness	.....	.....	.....	.....	.....	.....	.....	161	.....	216	.....	.....	269	287	.....
Screening in summer	.....	.....	.....	92	.....	.....	.....	161	.....	216	.....	.....	269	287	.....
Water supply	51	.....	80	92	.....	.....	.....	161	.....	216	.....	.....	269	287	.....
Manure, garbage, flies	52	.....	81	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Disposal of human excreta	51	.....	80	92	.....	.....	.....	162	.....	216	.....	.....	269	288	.....
Milk, other food supplies	52	.....	81	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Health administration	53	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	269	.....	.....
Typhoid fever prevalence	53	70	81	93	118	130	148	163	203	217	237	252	273	289	301
General morbidity	.....	.....	.....	.....	.....	.....	.....	.....	.....	217	237	253	273	289	.....
Sanitary measures recommended	53	70	82	94	119	131	148	163	203	220	239	253	274	289	301
Cooperation	54	71	83	94	119	131	148	164	204	220	240	255	275	290	301
Sanitation days	.....	.....	.....	.....	.....	132	.....	.....	.....	222	.....	.....	.....	291	.....
Results	54	72	84	98	119	136	150	164	204	222	242	255	275	291	302
Country homes	54	72	84	98	119	136	150	164	204	222	242	256	275	291	302
Industrial settlements	.....	72	.....	.....	.....	139	150	165	205	223	242	256	.....	.....	.....
Towns, cities	55	72	84	98	119	136	150	165	205	224	243	257	277	291	302
Public places	55	72	.....	98	.....	.....	.....	.....	.....	223	.....	258	.....	.....	302
Typhoid fever reduction	58	73	85	99	120	139	151	166	.....	226	246	259	279	294	303
Subsequent progress	.....	.....	85	.....	.....	139	.....	.....	.....	.....	.....	.....	.....	.....	.....
Resurvey	59	74	.....	100	120	.....	152	167	.....	.....	.....	.....	.....	.....	.....
Conclusions	.....	.....	.....	.....	.....	.....	.....	168	205	226	246	260	279	294	303

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[1] Where subject is treated in but one or two of the county reports, it has been omitted from this table.

ILLUSTRATIONS.

CHARTS.

Page.
1. Reduction in typhoid fever in North Yakima, Wash 19
2. Reduction in typhoid fever in Yakima County, Wash 20
3. Reduction in typhoid fever case incidence in Berkeley County, W. Va 57
4 and 5. Reduction in deaths from typhoid fever in Berkeley County, W. Va. 58–59
6. Reduction in typhoid fever in Lawrence County, Ind 73
7. Reduction in typhoid fever case incidence in Union County, Miss 84
8. Reduction in typhoid fever in Dorchester County, Md 100
9. Case incidence of typhoid fever in Anne Arundel County, Md 121
10. Reduction in typhoid fever in Wilson County, Kans 138
11. Reduction in typhoid fever in Orange County, N. C 151
12. Reduction in deaths from typhoid fever in Walker County, Ala 166
13. Reduction in typhoid fever case incidence in Greenville County, S. C 225
14. Reduction in typhoid fever case incidence in Floyd County, Ga 245
15 and 16. Reduction in typhoid fever in Tuscaloosa, Ala 258–259
17. Reduction in deaths from typhoid fever in Obion County, Tenn 278

FIGURES.

1. Distribution of counties in which sanitary surveys have been made 9
2. Modes of spread of typhoid-fever infection 15
3. Agencies through which infections are conveyed across interstate lines from rural districts to cities 18
4. 1917 model of sanitary box for installation in old privies 32
5. Concrete set for a sanitary double-compartmented dry vault privy 32
6. Insanitary well 32
7. Sanitary well 32
8. Insanitary condition in alleys of towns 32
9. Typically insanitary privy at a farm home 32
10. Potentially dangerous pollution of vegetables 32
11. Insanitary privy draining into water-cress bed 32
12. Sanitary boxes and cans ready for installation 32
13. Negro residents who cooperated in effecting sanitary improvements in their community 32
14. Hauling privy contents in a sanitary manner 57
15, 16, and 17. Disposing of privy contents in a sanitary manner 57
18. Polluted spring in limestone section 61
19. Rear view of city high school showing proximity of insanitary privy 61
20. Insanitary alley in one of towns of Lawrence County 61
21. Public drinking cups in use at school 61
22. Sanitary advancement from community club influence 61
23. Delivering cans for installation in sanitary privies under construction in Mitchell, Ind 61
24. Old and new privies in Bedford, Ind 61
25. Typical sanitary privy installed in Mitchell, Ind 61

Page.
26. Insanitary privy at tomato cannery.......... 86
27 and 28. Insanitary wells in Cambridge, Md.......... 86
29. Privy contents polluting ice pond.......... 86
30. A row of sanitary privies under construction in Cambridge, Md.......... 86
31. Old method of disposing of privy contents at Cambridge, Md.......... 86
32. New method of disposing of privy contents at Cambridge, Md.......... 86
33. Toilet for fruit pickers.......... 117
34. Privy in which dejecta from typhoid fever patient were deposited in Annapolis, Md.......... 117
35. Insanitary privies overhanging water.......... 117
36. Head of street parade in sanitation celebration at Fredonia, Kans.......... 132
37. Section of parade at Fredonia.......... 132
38, 39, and 40. Features of parade at Fredonia.......... 132
41. Insanitary privies in Jasper, Ala.......... 164
42. Insanitary privy with milk cow tethered near it.......... 164
43, 44, 45, and 46. Sanitary privies in Walker County, Ala.......... 164
47. Septic tank under construction in Dallas County, Iowa.......... 204
48. Primitive toilet in Greenville County, S. C.......... 209
49. Insanitary privies in a town in Greenville County, S. C.......... 209
50. Model sanitary privies exhibited and given away at a fair in Greenville County, S. C.......... 209
51. Demonstrating model sanitary privies at a fair in Greenville County, S. C. 209
52. Awarding prizes (sanitary privies) at a fair in Greenville County, S. 3..... 209
53. Boring wells at a cotton-mill village in Greenville County, S. C.......... 209
54. Building sanitary privy boxes at a rural lumber yard in Greenville County, S. C.......... 209
55, 56, 57, and 58. Operating municipal scavenger service in Tuscaloosa, Ala.. 258
59. Cans arriving for use in sanitary privies in one of the towns in Clay County, Mo.......... 292

RURAL SANITATION.[1]

A REPORT ON SPECIAL STUDIES MADE IN 15 COUNTIES IN 1914, 1915, AND 1916.

By L. L. Lumsden,
Surgeon, United States Public Health Service.

GENERAL DISCUSSION.

In the spring of 1914 the United States Public Health Service began a special study of rural sanitation. The study has been intensive in character and extensive in scope. It is still in progress. This is a progress report.

The purpose of the study is (1) to ascertain in detail what are the sanitary conditions in the rural districts of the United States with particular reference to their bearing on the interstate spread of communicable disease; (2) to determine improved methods for the correction of insanitary conditions, and (3) to determine to what extent in the average rural community of the United States persons with the responsibilities of citizenship will carry out indicated measures, which are readily within their means, to correct insanitary conditions which have been clearly pointed out to them as a serious menace to the health and lives of themselves and of their families.

The work has been conducted so as to be both investigative and educative. It has been in the nature of an experiment—an experiment on human beings—conducted along lines comparable to those followed in an experiment with chemicals and test tubes in a laboratory. Thousands of rural homes have been surveyed. Insanitary conditions found on the premises have been pointed out and their significance explained to the persons responsible for them. Reasonable and feasible methods for effecting the improvements needed have been described and demonstrated. Thus, the test has been to present to the consideration of the citizens of our rural districts definitely established facts of vital and—to them—of personal importance in the safeguarding of human health. The end result of this "test" will show to what extent the people individually and collectively are capable of understanding and of applying such facts so as to protect themselves against filth and filth-borne diseases.

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[1] Manuscript submitted for publication Jan. 14, 1918.

The work has been carried out in widely separated rural districts fairly representative, apparently, of our rural communities generally (fig. 1). Counties have been adopted as units for the work. The surveys of the counties have been made upon the request of and in cooperation with State and local health authorities. In the three years, 1914, 1915, and 1916, the survey covered 15 counties, as follows: Berkeley County, W. Va., Lawrence County, Ind., Union County, Miss., and Dorchester County, Md., in 1914; Anne Arundel County, Md., Wilson County, Kans., Orange County, N. C., Walker County, Ala., and Dallas County, Iowa, in 1915; Greenville County, S. C., Floyd County, Ga., Tuscaloosa County, Ala., Obion County, Tenn., Clay County, Mo., and Cumberland County, Ill., in 1916.

In 14 of these counties complete sanitary surveys, reaching practically every home, were made. In the other one, Tuscaloosa, Ala., the demonstration phase of the work was stressed and the house-to-house survey was limited to representative communities, which comprised, however, a large proportion of all the homes in the county.

In 1917 complete surveys were made of Hill County, Tex., Okmulgee County, Okla., Mason County, Ky., and of several communities in Wyoming. The reports on these surveys are now in course of preparation.

In the summer of 1917 the work in rural sanitation, along with other field operations of the Public Health Service, was concentrated in the areas around the national cantonments. Special studies of and demonstration work in rural sanitation are at the time this is written (December, 1917) in progress in sections of the following counties within extra cantonment areas: (1) Jefferson County in Kentucky; (2) Dekalb, (3) Fulton, (4) Walker, and (5) Bibb Counties in Georgia; (6) Calhoun and (7) Montgomery Counties in Alabama; (8) Prince George, (9) Chesterfield, and (10) Dinwiddie Counties in Virginia; (11) Polk and (12) Dallas Counties in Iowa; (13) Pulaski County in Arkansas, and (14) Hamilton County in Tennessee.

Thus the range of the studies already made is sufficiently wide to make the findings and the results of these studies significant.

In the counties surveyed prior to 1917 observations are being made from time to time with a view of ascertaining to some degree the eventual results of the work.

THE PROBLEM.

The problem of rural sanitation has been recognized by sanitarians as one of the most difficult and one of the most important with which this Nation is confronted.

It is difficult because of its diffuseness. It is important because it affects vitally so many of our people and because advancement in

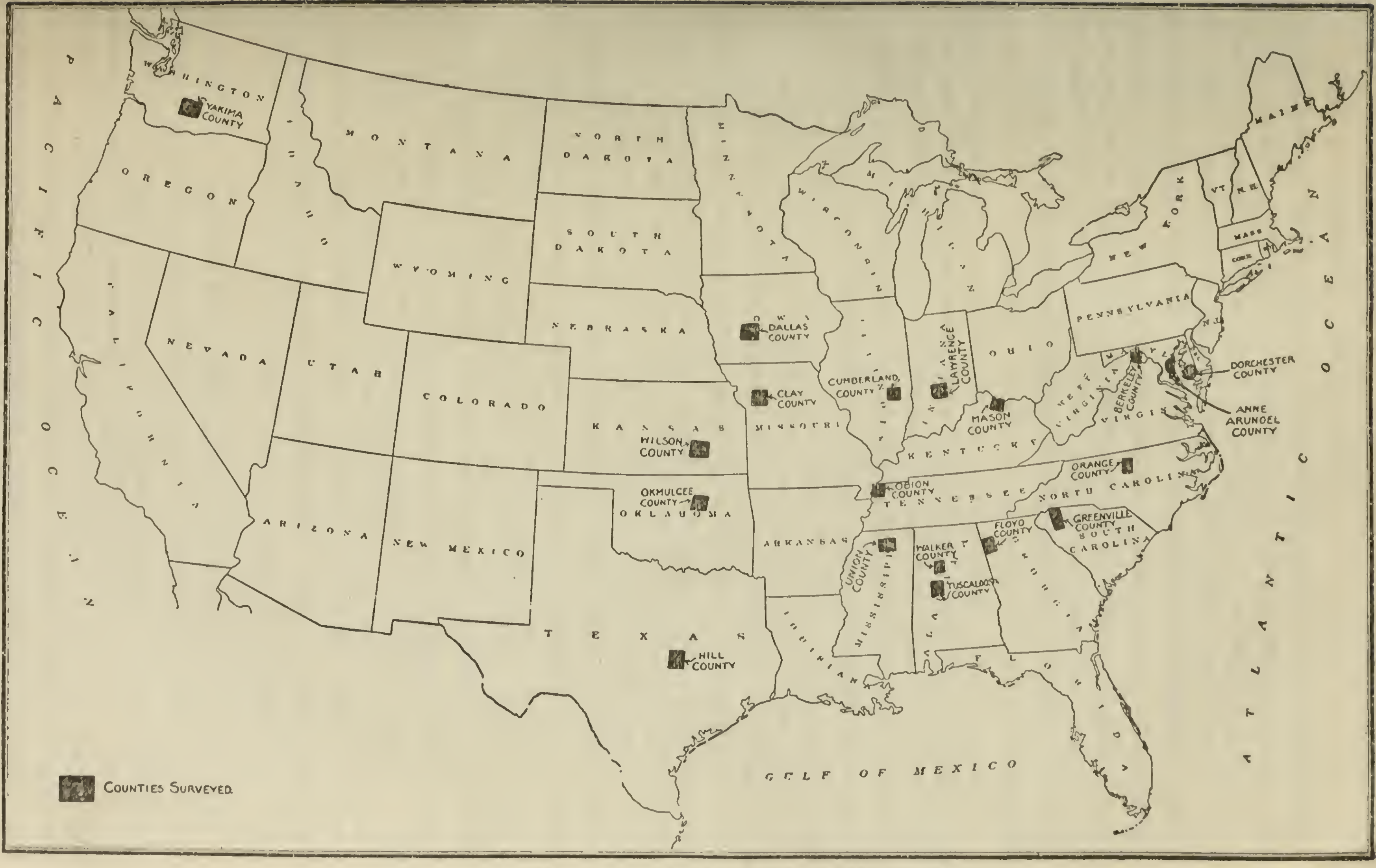

FIG. 1.—Counties in which sanitary surveys have been made.

rural sanitation would help to meet the need of making rural life more attractive and so tend to induce a larger proportion of our population to engage in the industry of food production.

According to the census figures, 53.7 per cent of the population of the United States, in 1910, resided in rural districts; that is, either in country homes or in villages or towns with populations under 2,500. Thus, over 50,000,000 of our people are constantly and directly exposed to conditions of rural life. This rural population is distributed over an immense area comprising over 3,000 counties. For the large majority of these people the only local government is the county government, and this in direct relation to conditions at their homes is as a rule manifested only by the annual visit of the tax assessor.

Diffuseness and difficulties of problem.—In a large city a small group of men, constituting the city council, may inaugurate measures which will accomplish sanitary improvements at thousands of homes; but for the accomplishment of sanitary improvements at 1,000 farm homes at least 1,000 persons with a wide range of individuality must be convinced that the sanitary measures are needed, become informed how to apply them, and be willing to put them into operation. In the well-ordered city, such important matters as water supply and disposal of sewage and other waste matter are dealt with in mass, under the direction of the municipal authorities, and the individual citizen has to concern himself with them but little. For the average rural district to obtain a water supply a spring must be found, a well dug or a cistern constructed for each home. The protection of the water supply against contamination depends upon the common sense, knowledge, and efforts of the many different householders. The methods of disposal of human excreta and of other refuse at a country home depend upon the knowledge of the subject and the sense of cleanliness exercised by the household. In the city there is usually a health organization to advise the citizens about health matters and to supervise the carrying out of the sanitary measures. In most of our country districts there is either little or no such supervision. The farmer must be to a large extent his own health officer, his own sanitary engineer, and the operator of his own refuse-disposal service.

The conveyance to our widely scattered rural population of specific and convincing information about the need of and methods for applying sanitary measures would, under the best conceivable conditions, be a tremendous undertaking. Among country people generally a conservative attitude toward innovations is manifested. News can not be spread through our rural districts so rapidly as through our cities. A rate of prevalence of typhoid fever or of some other communicable disease resulting from insanitary conditions, which in the average large city would be high enough to cause widespread publicity and considerable apprehension, occasions little or no concern in the average rural community.

Farmers who learn and carry out intelligently and energetically measures to safeguard their live stock, orchards, truck patches, or field crops against the spread of disease fail in most instances to seek and apply knowledge of simple and relatively inexpensive measures to safeguard their families against imminent and dangerous communicable disease. This is the case not because the farmer is more concerned about the welfare of his live stock or crops than he is about the welfare of his family, but because he has formed a habit of working to safeguard his farm products and, curiously, of leaving to chance the protection of the health and lives of the members of his family.

The great sanitary measures, such as the installation of good public water supplies and sewer systems, which have been so effective in the protection of health of cities, are not as a rule feasible for rural communities. The operation of a public scavenger service for the proper collection and disposal of privy contents is not practicable for the average country neighborhood. Due to greater distances to be covered, adequate official supervision over sanitary matters for rural homes is much more expensive than is similar supervision for an equal number of city homes. At the same time the receipts from taxation of property and incomes, from which local health organizations must be supported, are in proportion to population as a rule much less for the rural than for the urban community. The farmer from long experience has formed a habit of thinking that most things, including sanitary matters on his place, come strictly and solely under his own authority. To him his place is in almost all respects a governmental unit. The city dweller from long experience has formed a habit of expecting the municipal authorities to look after certain conditions which most intimately affect his home.

For these several reasons, rural sanitation depends for its advancement largely—certainly more largely than does urban sanitation—upon the observance and practice of sanitary principles by the individual citizen. This means that a reasonable degree of sanitation for our rural districts can not be expected until the average citizen shall appreciate the importance of, and understand the details of applying, sanitary measures, or, at least, will follow the example of his neighbors who do. Thus, the problem of rural sanitation is a phase of the general problem of education.

Education essential to solution.—The marked advancement in recent years in education along other lines furnishes good reason for believing that eventually reasonable progress will be made in the education of our people along the lines of rural sanitation.

Since specific education of the masses of the people appears essential to reasonable advancement of rural sanitation, the problem of how to educate confronts us for solution. In recent times a good many eminent sanitarians have taken the position that it is futile to undertake the education along sanitary lines of American adults, and that it is best to concentrate effort in this direction upon the school children. As year after year and month after month, however, substantial progress in the education of American adults in other lines is being manifested, such a position appears illogical and reflects upon the methods hitherto employed rather than upon the principle involved. There is no question about the great importance of getting implanted in the minds of the youth of our land correct ideas of cleanliness; but with sanitation taught in the schoolroom and with a polluted well and an insanitary privy used in the school yard, which is far from an uncommon situation, it is easy to understand that in many instances the teaching will not carry conviction to the minds of the children. The sanitation of the school premises depends largely, of course, upon the sanitary education of the adult patrons and authorities of the school, and without some intelligent cooperation from these adults sanitation can not be taught to full advantage to the school children.

Whole-time county health organizations to teach the lessons and to demonstrate the benefits of sanitary improvements are frequently suggested as the means for the advancement of sanitation in our rural communities. The county health organization appears to be a logical unit for the administration of health affairs in rural communities, and so far the suggestion is good; but it should be realized that whole-time, adequate county health organizations cost money. Unless the people who pay the taxes are willing, the local governmental authorities can not be expected to collect and expend public funds for health work. Thus we reason in a circle and return to "education."

Two plans of conducting an educational campaign for rural sanitation appear feasible: The one wide in scope but superficial, here a little and there a little; the other, concentrated and concrete, purposed to effect a definite demonstration in a limited territory. The first of these plans, consisting of occasional popular lectures in different sections and widespread distribution of literature, has been carried out in good earnest by some of our State health organizations and by the United States Public Health Service. This plan is necessarily slow in demonstrable effect, but it unquestionably does good and helps pave the way for successful intensive work. The second plan is conducted along the same general lines as the first, but is conducted intensively and persistently to present specific information to practically all persons in one or more limited localities.

The expenditures of funds obtained from general sources and intended for general welfare for work on this intensive plan appears justified because a definite demonstration in a limited locality in these days of rapid publicity will have a far-reaching educational effect. Furthermore, it appears to be better for the general cause of sanitation to have 10 persons educated to a reasonably thorough degree on the subject than to have 100 persons educated on the subject to one-tenth of that degree.

One of the main ends to be attained by an intensive educational campaign for sanitation is the creation of adequate local health organizations. The people of the average community need to be educated to appreciate that money intelligently spent for the prevention of disease is money saved from loss in diminished earnings and in the care and treatment of the sick. They need to know that an efficient whole-time county health officer is worth to the community many times over the amount of his salary. At the present time many of our rural people are willing enough to expend money liberally to secure the best treatment available for their sick but will offer strenuous objections to a thoroughly reasonable expenditure of public money for the employment of a health officer to prevent sickness. Without an adequate local health organization to direct the work it appears that, in the average community, a reasonably good standard of sanitation will not be attained and maintained.

Importance.—The need of advancement of rural sanitation is all too obvious even from casual observation. In the cruder matters of sanitation, such as the cleanly disposal of human excreta, the safeguarding of water supplies against contamination with filth, and the protection of foods from invasion by flies, most of our country homes are lacking. As a result of the insanitary conditions in our rural districts, thousands of our people every year needlessly die.

Considering the many natural advantages of country life, the residents of our rural districts should be much healthier than those of our cities. Among the 60,000,000 people in our registration area, however, the rural death rate is annually only about 2 per 1,000 less than the urban death rate. For our nonregistration area the difference is, according to such figures as are available, even less.

The statistics show that much better progress in the prevention of disease is being made in our cities than in our rural districts. In the registration States the death rate in the period 1900–1912 was decreased in the cities by 21.2 per cent and in the rural districts by only 8.6 per cent.

Certain diseases which are communicable—that is, caused by infections transmitted from person to person—are, notwithstanding the sparser population, much more prevalent in our rural than in our urban sections. Malaria and hookworm disease are almost entirely diseases of rural origin. In many sections of this country typhoid fever is more prevalent in the rural districts than in the cities.

The distribution of typhoid fever in the census year 1900, the last year for which we have such data for the whole country, is shown in the following table:

Region.	Percentage which the typhoid deaths in 1900 were of the total deaths.	
	Rural.	Cities.
North Atlantic Coast region	1.17	1.29
Middle Atlantic Coast region	2.54	1.15
South Atlantic Coast region	4.95	2.31
Gulf Coast region	6.16	2.38

The following table gives, according to the figures in the Mortality Reports of the United States Census Bureau, the typhoid fever death rates per 100,000 population (*a*) in the cities (having 10,000 or more inhabitants in 1910) and (*b*) in the rural districts of each registration State in 1915:

State.	Death rate per 100,000 population from typhoid fever in 1915.		State.	Death rate per 100,000 population from typhoid fever in 1915.	
	Cities with populations of 10,000 or over.	Rural districts[1] (including cities with populations under 10,000).		Cities with populations of 10,000 or over.	Rural districts[1] (including cities with populations under 10,000).
California	8.7	11.0	New Hampshire	7.5	7.9
Colorado	9.1	14.9	New Jersey	6.9	6.4
Connecticut	14.5	7.9	New York	7.4	8.3
Indiana	16.0	14.3	North Carolina	26.9	43.2
Kansas	18.3	8.3	Ohio	15.4	12.9
Kentucky	19.1	32.9	Pennsylvania	12.5	12.2
Maine	20.3	11.3	Rhode Island	9.2	14.1
Maryland	21.8	25.4	Utah	6.2	11.1
Massachusetts	7.2	5.3	Vermont	35.4	9.5
Michigan	16.6	8.5	Virginia	17.5	25.3
Minnesota	9.3	5.5	Washington	6.8	9.3
Missouri	10.8	18.1	Wisconsin	6.8	3.8
Montana	14.4	12.2			

[1] NOTE.—Figures are not available for the direct comparison of the typhoid rate in the urban and strictly rural districts.

From such data as are available, it is conservatively estimated that there have been as an annual average in the last decade in the United States 2,000,000 cases of hookworm disease, 350,000 cases of and 30,000 deaths from typhoid fever, 9,000,000 cases of and 3,000 deaths from malaria.

These diseases result largely from insanitary conditions in our rural districts. They are preventable diseases. The economic loss to the Nation each year from malaria and typhoid fever has been estimated at $900,000,000. The prevention of typhoid fever, hookworm disease and malaria has a profound influence in the prevention of many other diseases, including tuberculosis. It has been found that by carrying out sanitary measures which effect a reduction in the typhoid fever rate there is a prevention of about three deaths from other causes for each death from typhoid fever prevented.

Typhoid fever is a disease which can prevail in any kind of climate and its rate of prevalence in a community is an index of insanitary conditions. It is a disease which essentially is caused by insanitary disposal of human excreta (fig. 2), and sanitation for its prevention will prevent many other diseases such as hookworm and dysentery and will have a profound effect in the prevention of deaths in infants from summer diarrheas.

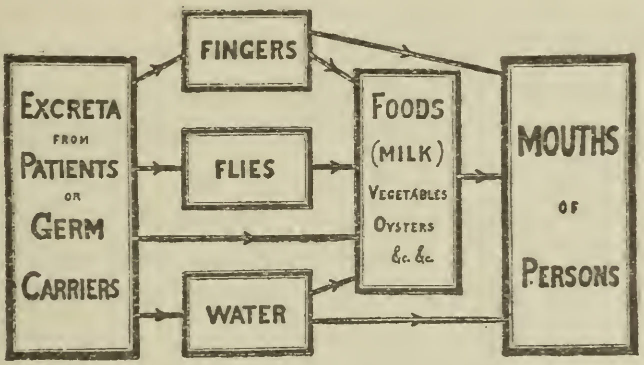

FIG. 2.—Modes of spread of typhoid fever.

It is gratifying to find from the statistics that the typhoid fever rate in the United States has been reduced in the last 30 years by about 50 per cent. Much more progress in sanitation for the prevention of this disease in our country appears, however, to be indicated. The following tables show that we have not kept up with some of the other large nations in the prevention of this comparatively readily preventable disease:

Lives saved in Germany during 10-year period because of a lower typhoid fever rate.

	German rate.	United States rate.	Difference.	Population of Germany.	Lives saved.
1903	7.3	34.1	26.8	54,969,000	14,729
1904	7.4	31.7	24.3	58,433,000	14,199
1905	6.3	27.8	21.5	59,413,000	12,773
1906	5.7	31.3	25.6	61,153,000	15,654
1907	4.8	29.5	24.7	62,013,000	15,316
1908	4.7	24.3	19.6	62,863,000	12,320
1909	4.2	21.1	16.9	63,717,000	10,767
1910	4.0	23.5	19.5	64,568,000	11,589
1911	4.9	21.0	16.1	65,359,000	10,521
1912	3.3	16.5	13.2	66,145,000	8,730
Total					126,598

Lives saved in England and Wales during 10-year period because of a lower typhoid fever rate.

	English rate.	United States rate.	Difference.	Population of England.	Lives saved.
1903	10.1	34.1	24.0	33,293,000	7,990
1904	9.4	31.7	22.3	33,639,000	7,501
1905	8.9	27.8	18.9	33,989,000	6,424
1906	9.2	31.3	22.1	33,342,000	7,590
1907	6.7	29.5	22.8	34,699,000	7,911
1908	7.5	24.3	16.8	35,059,000	5,890
1909	6.0	21.1	15.1	35,424,000	5,349
1910	5.3	23.5	18.2	35,792,000	6,514
1911	6.7	21.0	14.3	36,190,000	5,175
1912	4.4	16.5	12.1	36,382,000	4,402
1913	4.1	17.9	13.8	36,606,000	5,058
Total					69,804

From a study of the data available it seems clear that the reduction in typhoid fever in the United States in the last half century has resulted largely, if not entirely, from sanitary progress in our larger urban centers. In our rural districts generally during this period no sanitary progress apparently has been made, and in many instances, due to increasing density of population, sanitary conditions actually have become worse. Whatever reduction in typhoid fever has occurred in our rural districts must have been due to a lessening of seeding of the rural districts with infection from the cities as sanitary improvements in the cities were accomplished.

Relation to urban health.—The insanitary conditions in our rural districts are a menace not only to the rural people, but also to the people of the cities. Thousands of city residents visit the country every day for business or social reasons. The vast bulk of milk and other fresh foods supplied our large cities is brought in from farm homes. Most of the cities obtain their water supplies from open streams or lakes which receive drainage from extensive rural territories. Through any of these media—persons, foods, or water—and also by flies and mosquitoes, infections spread from insanitary rural premises may be conveyed to persons residing in the city (fig. 3). Thus the sanitation of the rural districts has a direct bearing on the health of the whole Nation.

Principles involved.—The same principles of sanitation which apply to a large group of homes constituting a city apply to an isolated country home and even to camps of nomadic tribes. From an equal degree of sanitation the country neighborhood with its sparser population will have greater protection from communicable disease than will the city. The resident of the rural district has many advantages over his city brother in respect to opportunity by individual effort to carry out measures for health protection. Among the savage tribes roaming the wildernesses of America disease from filth-borne infection probably was of rare occurrence. They did not remove their filth but they removed themselves from their filth. Under modern conditions any rural family can obtain, with very little labor or expense, absolute protection against typhoid fever, hookworm disease, dysentery, and all other diseases caused by filth-borne infection. In our national encampments during the Spanish-American war, the population density of city life and the usual insanitary conditions of country life obtained, and one in about every five of the men in those encampments developed typhoid fever. In our rural villages and towns the insanitary conditions obtaining at the present time constitute an especially serious menace to our national health.

If our rural people generally would grasp and apply the simple but vitally important facts which sanitary science has definitely established, this Nation would be relieved of a tremendous burden of sickness and death and of lessened efficiency and economic waste. The determination of practicable methods for fixing these facts upon the attention of the people is the sanitarian's biggest problem.

Interstate scope.—Under existing conditions infection is frequently conveyed from the rural districts of one State to communities in other States (fig. 3.) Mosquitoes carrying malaria infection and flies carrying typhoid infection will cross a State line as regardlessly as they will cross a county line or a line fence between two farms. The average large American city obtains its supply of milk, green vegetables, and fruits from as many as five or six different States. Any of these foods may be the vehicle of infection. Insanitary conditions at farm homes in one State often are responsible for the contamination of milk or other foods with the seeds of infection which cause extensive outbreaks of disease in cities, towns, villages, or country neighborhoods in other States. Many of our cities and towns obtain their water supplies from streams or lakes which are polluted with the drainage from extensive rural districts in two or more States. Persons carrying infection in their bodies often travel from one State to others, and with the usual toilet arrangements found on our interstate railway trains, may scatter infection along the tracks over which they travel. In view of these facts, it is clear that insanitary conditions in the rural districts of one State are, through commerce and otherwise, a menace to contiguous States especially, and, on account of modern transportation facilities, a menace to the whole country. Having such an important bearing on the character of farm products shipped from one State to others, the problem of rural sanitation appears to be one with which the National Government under constitutional authority may deal and one with which the National Government from a standpoint of general welfare should deal.

Since this problem of rural sanitation is both intrastate and interstate in character it appears to be one which should be attacked by the coordinated efforts of county, State, and national health authorities.

PLAN OF WORK.

The plan of work adopted by the Public Health Service in its attack on this great problem of rural sanitation was suggested by the results from an intensive sanitary survey in Yakima County, Wash., in 1911 (charts 1 and 2). Yakima County had had every year, as far back as the records went, a high typhoid fever rate—over three times as high as the average rate for the United States as a whole. In the summer of 1911 a campaign for improved sanitation was conducted in that county[1] by the United States Public

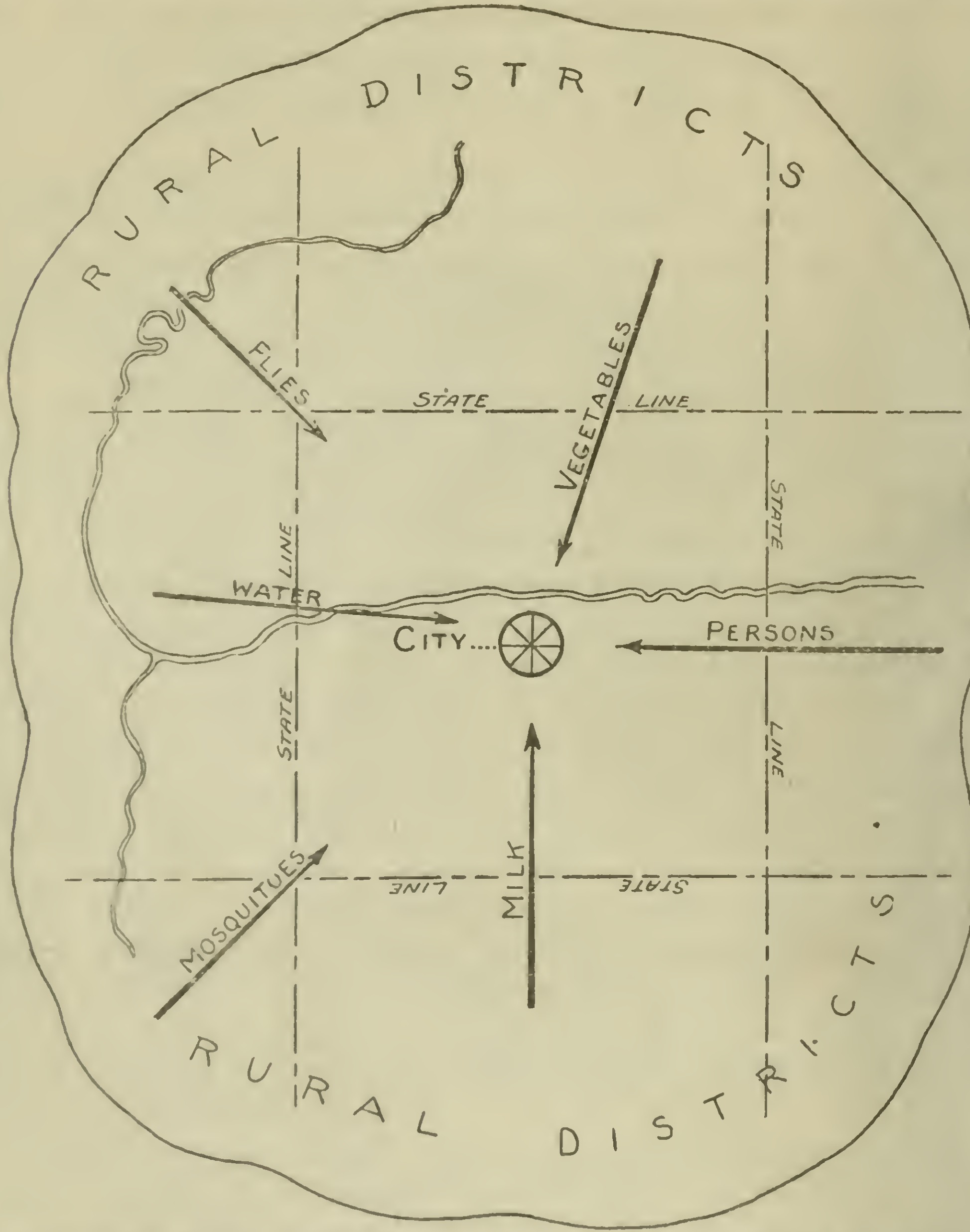

FIG. 3.—Agencies through which infections are conveyed across interstate lines from rural districts to cities.

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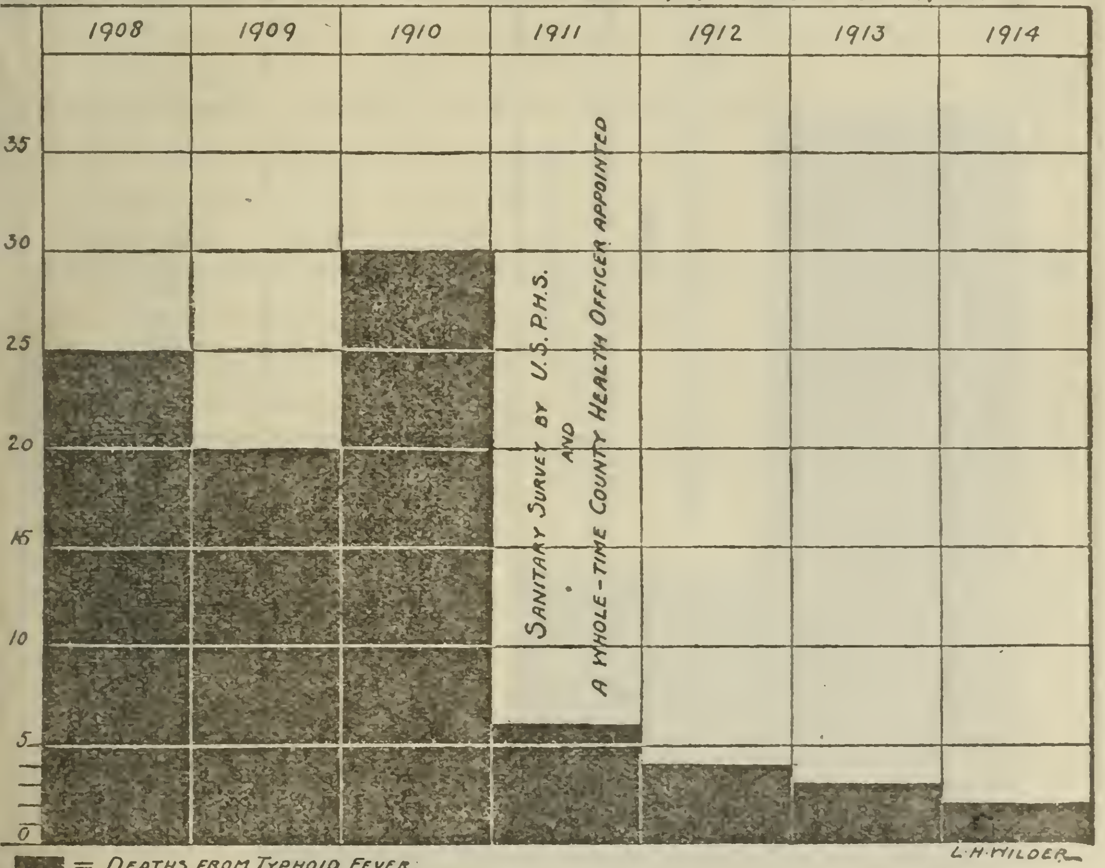
[1] Public Health Bulletin No. 51.

Health Service in cooperation with the State and county health organizations. Practical measures for the correction of the obviously insanitary conditions were recommended by the investigators and were carried out by the local people. As a result, the annual prevalence of typhoid fever in the county, as a whole, was reduced by about 90 per cent. In North Yakima, the principal town and the county seat, with a population of 14,082 in 1910 and of about 18,700 in 1914, the number of deaths from typhoid fever reported each year in the period of seven years, including that of the campaign (1911), was as follows:

CHART I.

DEATHS FROM TYPHOID FEVER IN NORTH YAKIMA, WASHINGTON, BEFORE AND AFTER A SURVEY OF LOCAL SANITARY CONDITIONS BY THE U.S. PUBLIC HEALTH SERVICE IN 1911. POPULATION 15,000.



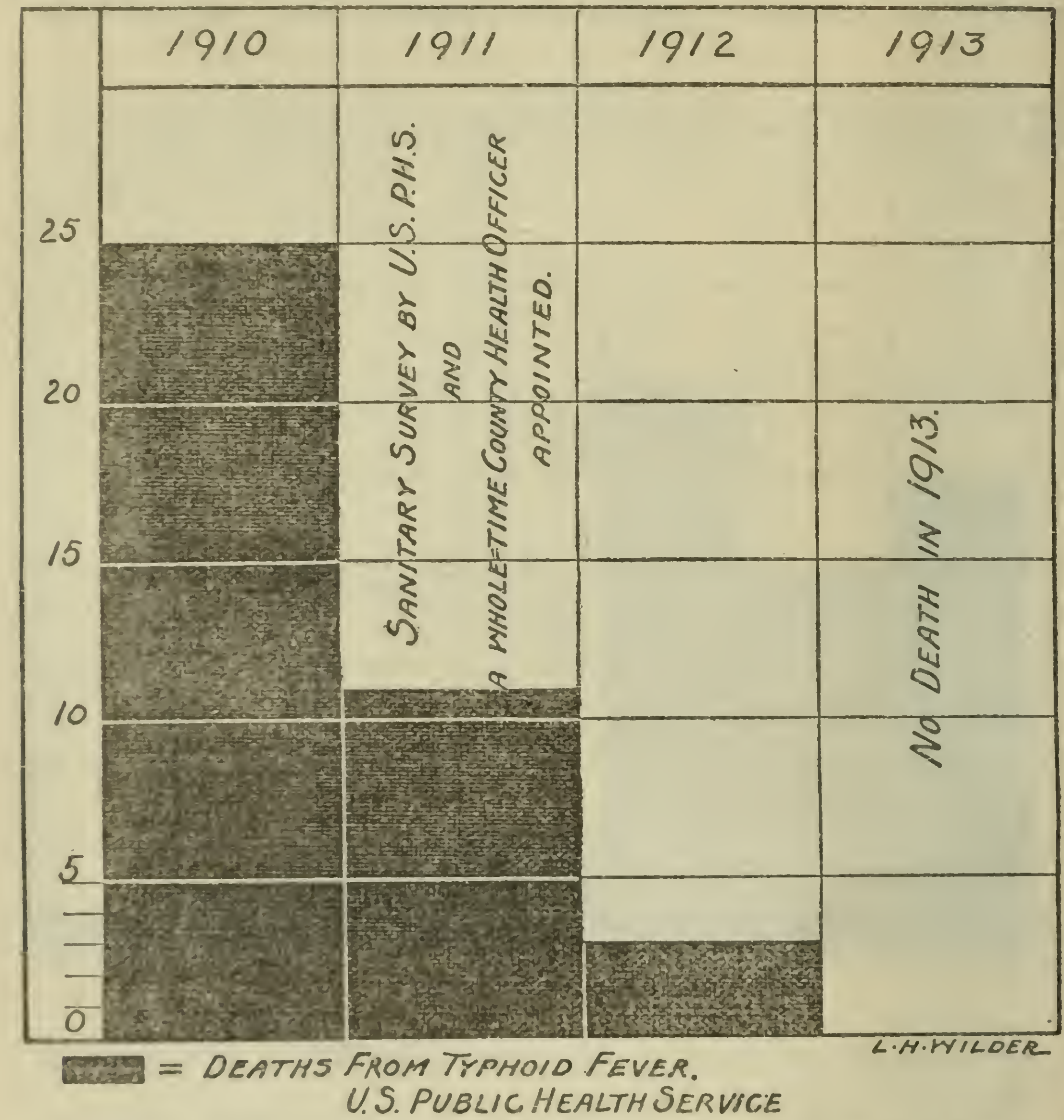
▆ = DEATHS FROM TYPHOID FEVER.

U.S. PUBLIC HEALTH SERVICE

In 1908, twenty-five; in 1909, twenty; in 1910, thirty; in 1911. six; in 1912, four; in 1913, three; in 1914, two. Of the deaths in 1911, 1912, 1913, and 1914, two, four, three, and two, respectively, were of persons who had contracted the disease elsewhere and who were brought to North Yakima for treatment. Thus in the period of three years—1912, 1913, and 1914—not a death from typhoid fever of local origin was reported in this once heavily infested locality. In Yakima County, outside of North Yakima, deaths from typhoid fever were reported as follows: In 1910, twenty-five; in 1911, eleven; in 1912, three; in 1913, none. The following table, which presents the number of deaths from all causes reported for the year before, the year of, and the three years after the campaign, shows that a reduction in the death rate from causes other than typhoid fever also was effected:

CHART 2.

DEATHS FROM TYPHOID FEVER IN YAKIMA COUNTY, OUTSIDE THE CITY OF NORTH YAKIMA, BEFORE AND AFTER A SANITARY SURVEY BY U.S. PUBLIC HEALTH SERVICE IN 1911.
POPULATION 30,000.



Deaths from all causes.

Year.	North Yakima.	Yakima County.[1]	Entire county.
1910	251	266	517
1911	210	242	452
1912	151	226	377
1913	202	240	442
1914	160	254	414

[1] Exclusive of North Yakima.

Striking as these figures are, they become more so when considered in connection with the progressively increasing population of the county.

While the work was in progress, Yakima County established the precedent of creating the position of whole-time county health officer. A competent sanitarian was appointed to fill the position at a salary of $5,000 a year. The annual appropriation for health work was increased by about $6,500, and the results in the prevention of sickness and the economic losses incident thereto indicated that this was one of the best financial investments ever made by a county.

With this remarkable demonstration furnished by Yakima County, it seemed possible that by intensive methods of work popular sentiment could be aroused for the advancement of sanitation in rural communities generally. It was realized, however, that conclusions about the prospects for success could not be drawn from the results in one county and that studies in counties presenting a wide range of conditions were needed.

From 1911 to 1914, the Public Health Service conducted studies of a number of typhoid fever outbreaks in country neighborhoods in different parts of the United States. Most of the outbreaks studied were in the State of Virginia. From these studies the direct relation of insanitary conditions to the spread of disease was clearly defined and the most salient features of sanitation needed at our rural homes generally were determined.

In 1914, a few thousand dollars from the fund appropriated for "field investigations by the Public Health Service" were allotted for special studies of rural sanitation. Having received requests for the survey from the State and the local authorities, the work that year was begun in Berkeley County, W. Va., on April 1; in Lawrence County, Ind., on May 7; in Union County, Miss., on June 16; and in Dorchester County, Md., on July 10. The personnel of the working force consisted of commissioned medical officers and special temporary appointees of the Public Health Service and representatives of the respective State Boards of Health. In each of these four counties the work was terminated on November 15. The cost to the National Government of this work in 1914 was about $18,000. The results were highly encouraging. In each of the counties marked improvement in sanitary conditions was effected and a wholesome reduction in typhoid fever and other diseases occurred. In three of the four counties in which fairly satisfactory mortality statistics for the previous year were obtainable, the aggregate number of deaths from typhoid fever in the last six months of 1914 was 45 less than in the corresponding period of 1913.

Since 1914 the work has been increased from year to year. Among the appropriations for the operations of the Public Health Service in the fiscal year, beginning July 1, 1917, is an item of $150,000 for "Special studies of and demonstration work in rural sanitation." To encourage the State and local authorities to take an active part in the work and so increase the likelihood of making it permanently and increasingly effective, this item carries a provision "that no part of this appropriation shall be available for demonstration work in rural sanitation in any community unless the State, county, or municipality in which the community is located agrees to pay one-half the expense of such demonstration work." Under this provision it will be possible to conduct the demonstraton part of the work on an intensive and a lasting scale. It has been deemed advisable to extend the investigation part of the work, as rapidly as circumstances will permit, to one or two representative counties in each State. By so doing an accurate record could be made of average sanitary conditions in the rural districts of the United States, data would be collected which would be useful in the determination of improved methods for correcting insanitary conditions and, with the educational effect of conducting such investigations under the direct observation of the persons exposed to the conditions, foci of advanced rural sanitation would be established in each of our States. By the expenditure of about $3,000,000 a year for a period of five years a complete sanitary survey of practically every home with a reasonably adequate degree of demonstration work in rural sanitation could be accomplished in each of the 3,000 counties which are comprised in part or in whole by our rural districts. With the conservative views prevailing generally in respect to investments for human health protection, the suggestion of a plan of sanitary work which, though nation-wide in scope, would require a sum of $15,000,000 for its consummation may appear bewildering. But when the returns in vital capital which could be realized from such work are measured, from the standpoint of the national defense, with the value of a battleship, which costs even more than $15,000,000, such a suggestion may appear to deserve serious consideration.

Selection of counties.—Since the Public Health Service began this plan of work in rural sanitation, requests for the work have been received from practically all of the State health organizations and from hundreds of county, township, and town governments and civic organizations. Thus, a wide range of opportunity has been furnished for the selection of communities which appeared best suited for the purpose of the work. The selections have been not of counties which gave greatest promise of sanitary advancement, but of counties which presented about average conditions for the section of the country in which they are located, so that the test of the work would be fair and the results of it indicative of what might be accomplished generally. Counties with high typhoid fever rates have been favored in the selection.

Preliminary arrangements.—Upon arrival in the county, visits are made to the county and town officials, to the officers of civic organizations and to the editors of the local newspapers and the plan of the work to be conducted explained to them in detail. In practically every instance the news value of the matter is appreciated and the local newspapers from the outset give the work good publicity. Public meetings in different parts of the county are scheduled and advertised. The following is a sample of poster used in advertising the meetings:

PUBLIC HEALTH MEETINGS.

PREVENTION OF

TYPHOID FEVER.

AND OTHER DISEASES TO BE DISCUSSED.

National, State, and County Health Organizations are conducting a campaign for the prevention of

PREVENTABLE DISEASES.

IN

-------------------- County

Active cooperation of citizens necessary for success.

COME TO THE MEETINGS AND LEARN HOW YOU CAN HELP.

PUBLIC CORDIALLY INVITED TO FOLLOWING MEETINGS:

At-- - - - - 11 a. m. June 22.
At-- - - - - 8 p. m. June 23.
At-- - - - - 8 p. m. June 24.
At-- - - - - 8 p. m. June 25.
At-- - - - - 8 p. m. June 26.

MEETINGS TO BE ADDRESSED BY

Dr. --------------, of the United States Public Health Service,
Dr. --------------, of the State Board of Health, and others.

STEREOPTICON PICTURES TO BE SHOWN.

At these meetings, which are almost invariably attended by large audiences, the principles of sanitation and the plan of the work to be conducted in the county are discussed. The facts especially emphasized are (1) that the benefits to the community to be derived from the work depend entirely upon the voluntary action of the individual citizen, and (2) that the trained sanitarians sent by the Government are to visit the homes, not with any authority to order the people to do things, but in a spirit of cooperation to obtain from the citizens information, and to impart to them information obtained from others, which may be applied for the welfare of the community.

A mailing list of the county is obtained from the register of voters, from the register of taxpayers or from the list of rural delivery routes and the following circular letter, signed by the Surgeon General of the Public Health Service and indorsed by the State health officer, is sent by mail from the office of the State board of health to every family in the county.

OFFICE OF THE SURGEON GENERAL,
TREASURY DEPARTMENT,
BUREAU OF THE PUBLIC HEALTH SERVICE,
Washington.

DEAR SIR: On request of your State Board of Health, and in cooperation with it and the county authorities, the United States Public Health Service is undertaking a study of conditions in your county affecting health, with special reference to the prevention of diseases such as typhoid fever. The salaries and expenses of the Public Health Service officers engaged in the work are borne wholly by the National Government. These officers are to visit your home and every other home in your county. This letter is to let you know in advance about work which you can help to make of particular benefit to your home and to your neighborhood.

This study of health conditions in your county is part of a general sanitary survey being made by the Public Health Service in representative counties in a number of States. The main purpose of this survey is to determine the sanitary conditions existing in the rural districts generally of the United States and the best methods for their improvement. In the last two years similar studies have been made in ---------- County, ------, ---------- County, ------, County, ------, ---------- County, ------, ---------- County, ------, ---------- County, ------, ---------- County, ------, and -------- County, ------. As a result of the surveys in those counties sanitary conditions have been improved and sickness reduced.

The officers who will visit the homes in your county are trained in sanitation, and after making their studies they will be able to advise about health conditions, particularly as to water supplies and refuse disposal, in each neighborhood. These men will learn from their studies in your community facts which may be presented with advantage to other communities. You may be able to obtain from them information, gathered from their studies in other communities, which will be of use to you in further protecting your household against preventable diseases.

The benefit to your community from this undertaking by your National, State, and county Governments will depend upon the active interest of the individual citizens. If you and your neighbors will give to the workers and the work your cordial support and assistance, your county can be made one of the several most healthful counties in the United States.

Respectfully,

RUPERT BLUE,
Surgeon General.

Your county is exceedingly fortunate in being one of those selected for this vitally important work, and I urge you to take full advantage of the opportunity afforded our citizens by the United States Public Health Service.

------------------------------,
State Health Officer.

Headquarters are established at the county seat, usually in the county courthouse. Models of sanitary devices and wall charts presenting salient sanitary facts are provided for exhibit in the receiving room at headquarters. A supply of public-health literature in suitable pamphlet form is provided for distribution both by mail and by hand. Maps of the county are secured. The county is arbitrarily divided into districts for convenience in conducting the canvass and survey. Each district is defined by readily recognizable boundaries such as railroads, streams, or public wagon roads. One or two of the workers is assigned to duty in each of these districts.

House-to-house canvass and survey.—The detailed work is usually carried out first in the towns. Upon completing the survey of a town a report of findings with definite recommendations is made in writing to the town council or board of commissioners. In the rural districts and, in most instances, in the towns also, every home is visited. Upon arrival at the home the investigator, wearing a distinctive uniform, which soon becomes generally known in the county, introduces himself and explains the purpose of his visit. Then, upon receiving an expression of willingness for him to do so, he proceeds to make the canvass and survey. In making the canvass and survey the following printed form card is used:

(Front.)

No............ Class.......................................

U. S. PUBLIC HEALTH SERVICE.

SANITARY SURVEY.

Town } District }..............................Card No..................... Date.................................

State............................ County............................. Township..................

Residence..

P. O.. R. F. D. No.................................

Name.. Business...........................

Name of owner.. Address...........................

Race.......... Nationality.......... Residence in County.......... this place...........................

Sells milk, vegetables, fruits—Details..

....

....

No. in household.......... No. had typhoid.......... when..

TYPHOID RECORD.

Deaths from typhoid, last decade, by years..

....

Cases since January 1, 19......, by year and month...

....

Contracted locally.............................. Elsewhere......................................

Secondary cases..

Disposal of patients' excreta, method..

Disinfection, efficient................ probably efficient............ none...........................

Physician.. Address...

To what does informant attribute this typhoid?..

Typhoid in general?..

Sanitary improvements since typhoid...

ILLNESS AND DEATHS IN LAST 12 MONTHS.

Nature.	Local.		Elsewhere.	
	Cases.	Deaths.	Cases.	Deaths.
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....

No. sick now.............................Sex............................Age.............................

Nature of illness...

....

(Back.)

Premises: Topography______________ Soil formation______________

Cows______ Horses______ Poultry______ Hogs______ Dogs______ Cats______

Protection of manure from flies______________

Distance of house from stable__________ Privy__________ Water supply__________

Dwelling: Character______________ Construction______________

No. of rooms__________ General cleanliness__________ Cellar__________

Screening______________

Unusual numbers of insects or rodents______________

Water supply: Source______________ Type______________

Drainage toward from privy______________ From stable______________

Distance from privy______________ From stable______________

Top______________ Water-tight______________ Made of______________

Casing
Wall ______________ Water-tight______________ Made of______________

Piped______________ Ditched______________ Curbing______________

Bucket______________ Pump______________ Depth of well______________

Does informant think water safe______________ Does investigator______________

Excreta disposal: Privy______________ Water closet______________

Location______________ Type______________

Are excreta accessible to chickens________dogs________cats________other animals?________

Are excreta likely to get into water supply________yard________truck patch________ fruit ground________

How?______________

How often is privy cleaned?______________

What is done with contents?______________

Is privy or water-closet used by all________men________women________children________

Water-closet effluent goes into______________

Attitude: Promises to improve________interested________indifferent________opposed________

Remarks______________

____

____

____

____

Investigator.

Score

Excreta disposal (50)__________

Water supply (30)__________

Screening (10)__________

General cleanliness (10)__________

Total (100)__________

Painstaking effort is made at every home visited to obtain fully and accurately all data called for by this card. In obtaining the subjective data about the health history of the family and in the discussion thereof the keen interest of the person interviewed usually is aroused in the principles of sanitation as applying to that particular home. In making the survey of the premises the investigator as a rule is accompanied by some responsible member of the household. Besides private homes, all hotels, railway stations, post offices, churches, schools, stores, and dairy farms are surveyed.

Educational efforts.—In the course of the house-to-house survey a report of findings on the premises is made to one or more responsible members of the household. Good conditions found are commended and methods for keeping them good described. Faulty conditions are pointed out, their dangers explained and simple, common-sense, feasible measures for correcting them described. A standing offer is made to reprimand any member of the survey force who, upon pointing out a faulty condition at any home, is not able to suggest a method, readily within the means of the family, for its correction. The phases of sanitation concentrated on in the work are those which bear on the prevention of typhoid fever and other filth-borne infections. It has been found that if more than this is undertaken at each home the interviews will be so long that they will tend to overtax the patience of the people and the presentation of the facts will cause confusion rather than clear understanding. The cleanly disposal of human excreta (stools and urine) is emphasized as the greatest single sanitary measure. The importance of carrying out measures to prevent the water supply from becoming contaminated and to prevent flies from carrying filth to foods and to the mouths of the children also is stressed. In the discussion of water supplies and flies, though, it is explained that neither of these agents can carry typhoid fever infection unless they are contaminated with human excreta. To families desiring it, or among whom there is apparent need of it, information is given about measures for the prevention of tuberculosis, malaria, pellagra, and other diseases.

The investigation in itself has an educative effect. A man, accompanying the investigator on the round of survey and seeing that drainage from the privy or the pigsty is entering his well and that chickens after scratching in the privy contents and the stable manure heap go with the filth on their feet to the leaky platform over the well, can not reasonably doubt that the water from that well, used by his family for drinking purposes, is not what it should be. In some instances uranine (a dyestuff with a high-color index) is employed to make ocular demonstration of free communication between privies or cesspools and water supplies. If fly maggots are found in exposed collections of stable manure or of human excreta they are demonstrated and their possibilities of doing harm explained. The ways in which existing insanitary deposits of human filth may be scattered about by flies, by drainage or seepage, and on the feet of animals so as to be conveyed to foods or water and thence to the mouths of persons, are pointed out. After the discussion of the findings, literature on health subjects suited apparently to the needs of the family is left at the home.

The following is a list of the bulletins generally used in the work:

Public Health Bulletin No. 68. Safe Disposal of Human Excreta at Unsewered Homes.
Public Health Bulletin No. 69. Typhoid Fever: Its Causation and Prevention.
Public Health Bulletin No. 70. Good Water for Farm Homes.
Supplement No. 29. The Transmission of Disease by Flies.
Supplement No. 18. Malaria. Lessons on Its Cause and Prevention.
Supplement No. 10. The Care of the Baby.
Reprint No. 228. The Treatment and Prevention of Pellagra.
Public Health Bulletin No. 36. Tuberculosis: Its Nature and Prevention.
Bulletin of the United States Department of Agriculture No. 57. Water Supply, Plumbing, and Sewage Disposal for Country Homes.

The number of bulletins distributed in the average county is about 10,000.

Each home surveyed is given a sanitary rating. In the score the maximum number of points allowed for excreta disposal is 50, for water supply 30, for screening of house 10, and for general cleanliness of the premises 10. The reasons for these relative weights and the sanitary rating given the home are explained, when practicable, to the head of the household. "General cleanliness" applies to dirt—such as leaves, waste paper, rags, ashes, and offal from poultry and hogs—with potentialities of danger slight as compared with those contained in what is described as the most dangerous of all dirt with which persons are likely to come into contact in the course of their daily lives, viz, the waste matter from the bodies of human beings. The relative dangers of different kinds of dirt are emphasized in discussing the respective weights in the score given for excreta disposal and for general cleanliness of the premises.

Besides the private lessons given in the course of the house-to-house visits, public lectures on the topic of sanitation are given from time to time. These lectures are usually illustrated with stereoptican slides. The language used is plain and simple. The lectures are given at meetings called for the purpose, and frequently, upon invitation, at meetings held primarily for some other purpose. The directors of religious revivals frequently ask for a public health lecture to be made a part of the services. In each county from 50 to 150 of these public lectures are given, and the attendance at the lectures averages over 25 per cent of the population of the county.

The meetings for the public lectures are arranged by the local citizens and, as a rule, at each of them some local citizen presides. The meetings are held in schoolhouses, churches, and other suitable places. In every neighborhood in the county, one or more of the regular public lectures is given—usually one before and one after the house-to-house visits in the neighborhood. Besides the regular lectures, special lectures on such subjects as malaria, tuberculosis, and pellagra are given, upon request, in neighborhoods in which it appears that lectures on such subjects may be of service.

In presenting the lecture two members of the survey party usually speak. One discusses the general principles of sanitation, and one describes the lantern slides. At the end of the lecture, questions and discussion are invited from the audience. Among the points brought out at the lectures are (1) that sanitation is the common-sense application of the principles of cleanliness, and means getting things clean and keeping them clean; (2) that cleanliness, in a sanitary sense, means freedom from dangerous dirt; (3) that dirt is matter out of place; (4) that the most dangerous dirt with which we are likely to come into contact in the course of our daily lives is waste matter discharged from the bodies of human beings; (5) that the waste matter from the bodies of persons apparently in good health in some instances carries infection and for that reason the cleanly disposal of all waste matter from every person, sick or well, is important; (6) that in each of the communicable or "catching" diseases there is what may be called the "eruption" of the disease; (7) that to catch such disease we must have introduced into our bodies some of the eruptive matter which has come from the body of some other person who is a carrier of the infection and who may be obviously ill or not; (8) that in smallpox the eruption is in the skin. that in diphtheria, "bad colds," influenza, measles, scarlet fever, whooping cough and mumps the eruption is in the throat and nose, that in "consumption" the eruption is in the lungs, and the eruptive matter is discharged in the sputum, that in malaria the eruption is in the blood and is conveyed from an infected person to others by means of a certain kind of mosquito, and that in typhoid fever the eruption is in the bowels and kidneys; (9) that for one to get typhoid fever one must swallow something contaminated with the eruptive matter discharged in the excreta from the bowels or kidneys of some other person; (10) that the cleanly, decent disposal of human excreta will prevent typhoid fever, the dysenteries, hookworm disease, much of the diarrhea of infant and adult life and much of the tuberculosis; (11) that exposed deposits of human excreta in woods, about barns, or other outhouses, and in insanitary toilets, may be scattered about by flies, by domesticated animals, by the feet of persons, and by surface drainage and subsoil seepage, so as to reach water and foods for human mouths, and are disgusting and dangerous; and (12) that measures for accomplishing cleanly disposal of human waste matter are simple, are among the very elements of decent living, are easily within the means of every family, and if carried out generally would relieve our cities of a great burden of suffering and needless loss of life, and enable our farmers to raise their most important crop—a crop of healthy, vigorous, happy children.

Models of sanitary devices are exhibited and described at the public meetings and also in the course of the house-to-house visits. Placards bearing inscriptions about sanitation are posted in public places and along the public roads from time to time. In the whole course of the educational phase of the work the slogan used is " Make good health contagious." At every opportunity the importance of having established an adequate county health organization permanently to look after the business of health in the county is emphasized.

Sanitary measures recommended at country homes.—The measures recommended and, whenever desired, described in detail at the country homes are (1) sanitary disposal of human excreta, (2) protection of water supply against potentially dangerous contamination, and (3) protection of foods against invasion by flies. Whenever requested, the investigators make recommendations about ventilation and heating of dwellings, and in malarial sections, about drainage and oiling to prevent breeding of Anopheline mosquitoes and about screening and the use of quinine to prevent the spread of malarial infection.

For sanitary disposal of human excreta measures readily within the economic means of the family are described. For those contemplating it, and able to meet the expense, the installation of water-closets and septic tanks is discussed. For those who state that they are unable to meet the expense of installing even the simplest sanitary devices, the details of practicing and the absolute sanitary value of the " Mosaic method " (Deuteronomy XXIII, 12 and 13) are presented. This method consists of voiding the matter directly into a shallow, freshly dug hole or ditch in the ground, at a suitable place, at least 200 feet from the dwelling or the water supply, and not upslope from either, and immediately covering the matter with earth. Even small children may soon be taught by their parents or other elders to practice this method. The installation of privies only of strictly sanitary type is recommended. By sanitary type is meant privies provided with water-tight receptacles to catch the excreta, and constructed so that they will be properly ventilated and so that flies can not gain access to excreta deposited in them (fig. 4). The importance of keeping privies clean and of systematic disposal in a sanitary manner of their contents is emphasized. The advantages and disadvantages of different types of sanitary privies are discussed. The types generally advised for country homes are either the L. R. S. privy, described in Public Health Bulletin No. 68, or the dry double-compartmented cement vault (fig. 5), described in a manuscript which is now being prepared for issue as a publication of the Public Health Service. In the dry vault, earth, lime, or ashes are used to take up the liquid in the excreta. Each compartment is sufficiently commodious for the amount of excreta deposited by the household in a period of about six months. Only one compartment must be used at a time. When the first compartment becomes filled, the cover over the seat is fastened down and the matter retained in it until the second compartment becomes filled. Then the first compartment is cleaned and again made ready for use. Thus the dried excreta are subjected to storage with a consequent considerable degree of purification and a practically entire abolishment of odor and other disagreeable features before removal for final disposal.

For protection of water supplies the boring and casing of deep wells to take the place of dug wells, the installation of pumps to take the place of buckets, proper curbing and water-tight platforms, or even a simple ditch around the well or spring to keep out surface drainage are advised, according to the needs of the situation and the mens of the family (figs. 6, 7). (See Public Health Bulletin No. 70.)

For protection of foods against invasion by flies, screening of dining room and kitchen, vigorous use of fly swatters in dwellings and in privies, the employment of large flytraps, and removal and "spreading" of stable manure at least once each week are advised. It is explained that effective flytraps can be made with a few cents worth of screening and an ordinary barrel or old dry-goods box and a little work.

Cooperation.—Special efforts are made to get for the work the active support of local medical societies, chambers of commerce, women's clubs, rotary clubs, labor unions, ministerial associations and other existing local organizations. Whenever requested, some member of the survey party attends the meetings of the local organizations to explain the plan and purpose of the work and to report progress. In some of the counties, sanitation clubs have been formed for the special purpose of cooperating with the force engaged in making the survey. Some of these clubs have had a membership of over 2,000, made up of representative citizens from different neighborhoods in all parts of the county. The support given by the local organizations has been helpful in advancing sanitation in the counties generally and has been particularly effective in getting carried out the programs of sanitation recommended for some of the towns. Through the cooperation of the clergymen, public health sermons are delivered from the pulpits. In some instances a Sunday is designated as "Sanitation Sunday," and on these occasions the pastor of

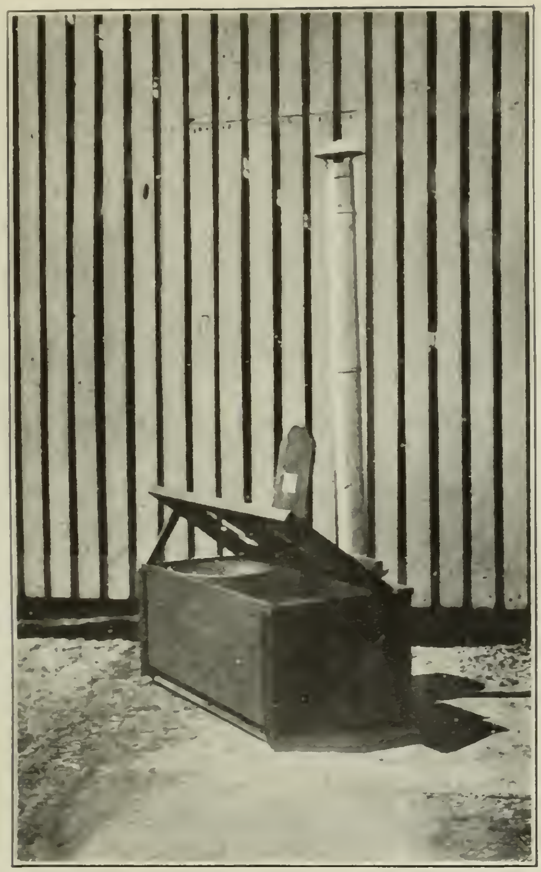


Fig. 4.—1917 model of Jasper sanitary-privy box the employment of which has facilitated the sanitation of privies in towns.

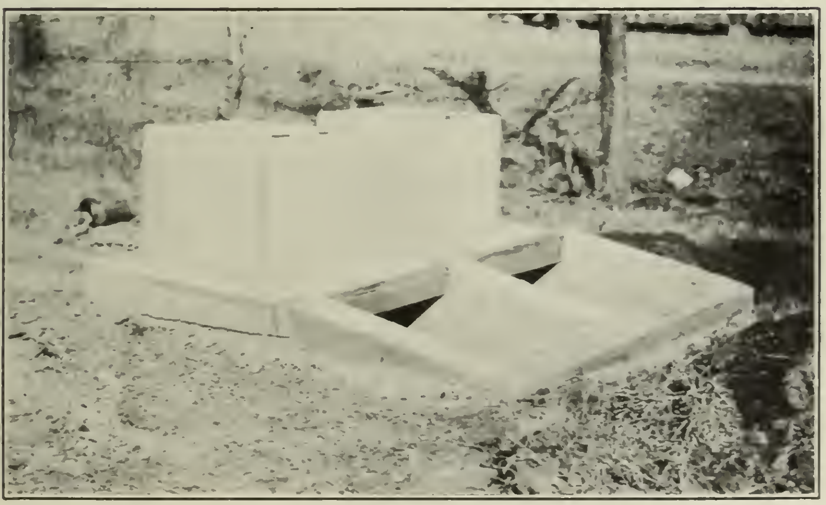


Fig. 5.—Concrete work completed for double-compartmented dry-vault privy. This type of sanitary privy has proved particularly well suited to country homes.

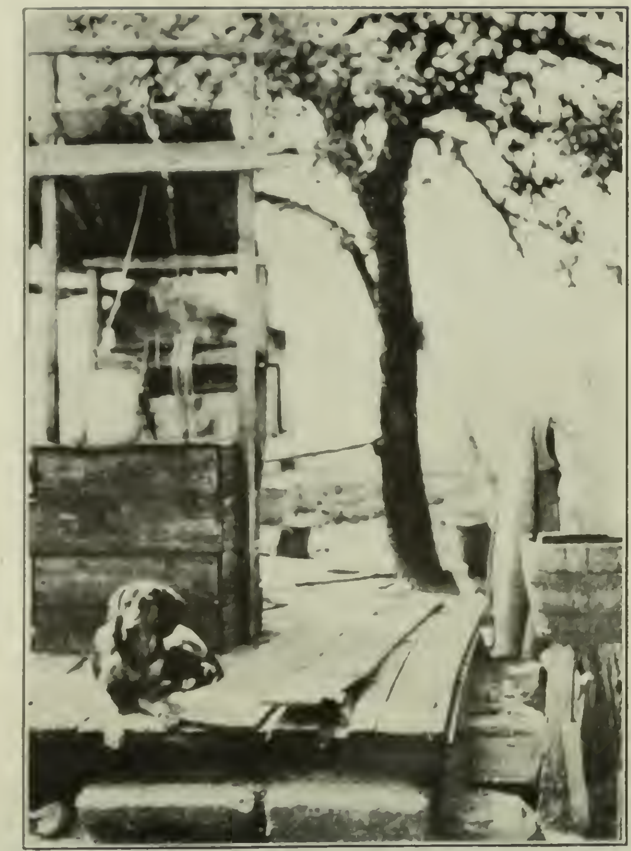


Fig. 6.—An insanitary well—said by the owner to furnish the best water in the county—which was obviously exposed to pollution from an insanitary privy, promiscuous deposits of human excreta, and a stable yard through surface and subsoil drainage and through carriage by animals.

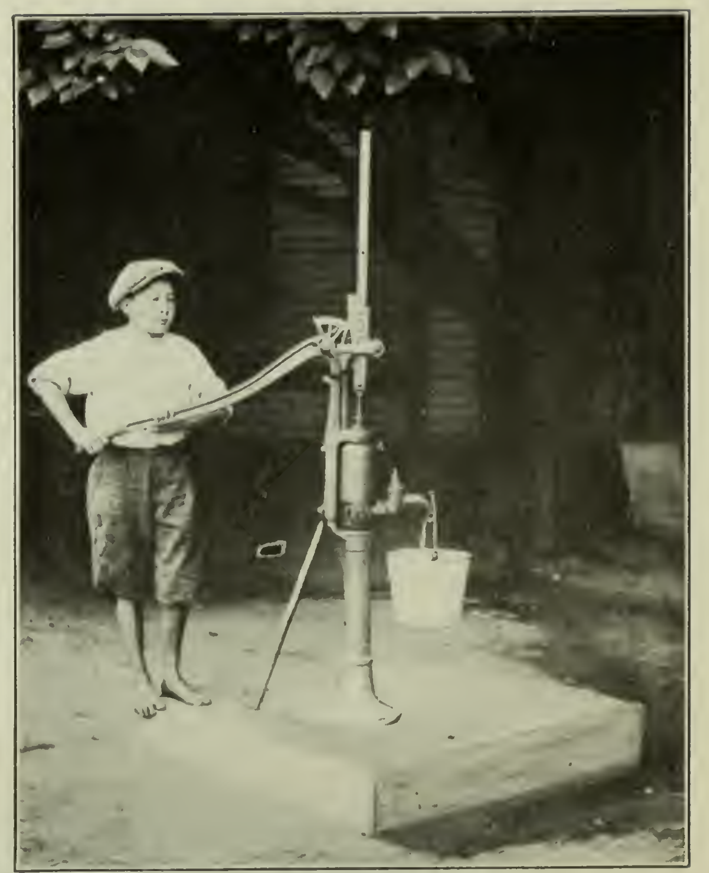


Fig. 7.—A sanitary well installed as the source of water supply to take the place of that furnished by a well similar to that shown in Fig. 6.

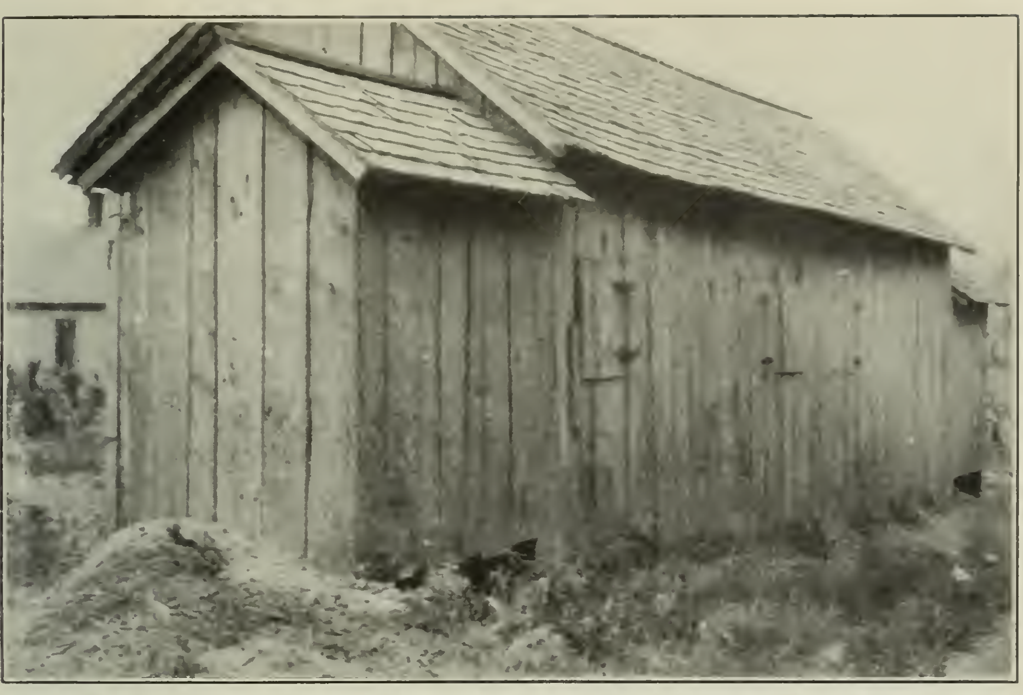


Fig. 8.—Photograph of fairly typical insanitary privies and manure heaps in alleys of towns in counties surveyed.

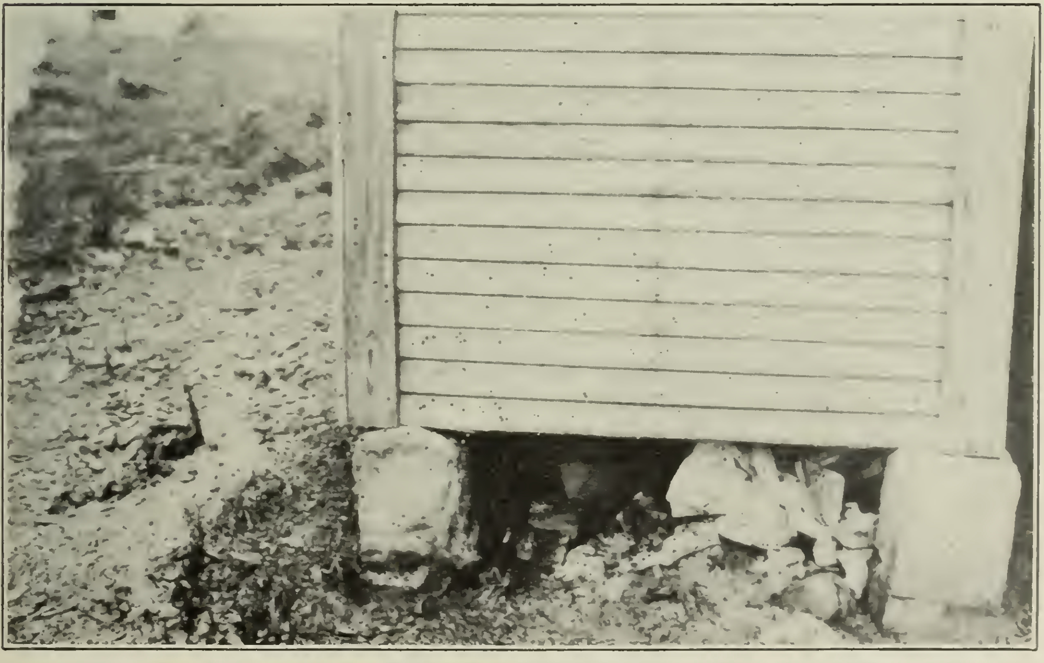


Fig. 9.—Typically insanitary privy at a farm home, showing flies swarming about the privy contents.

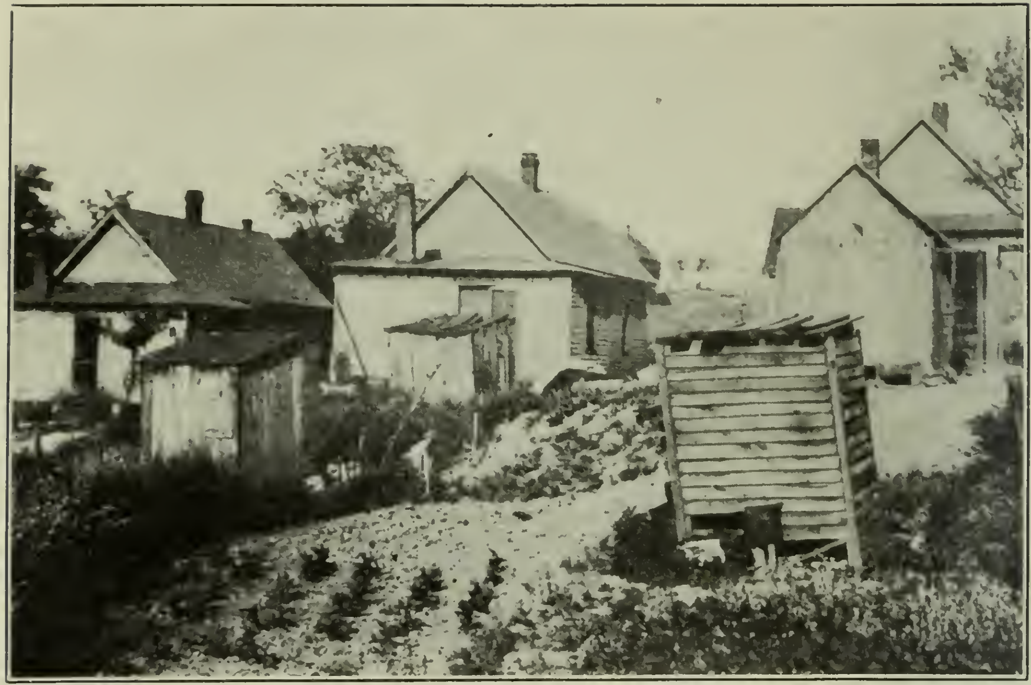


Fig. 10.—Contents of insanitary privies polluting growing vegetables in a rural village.

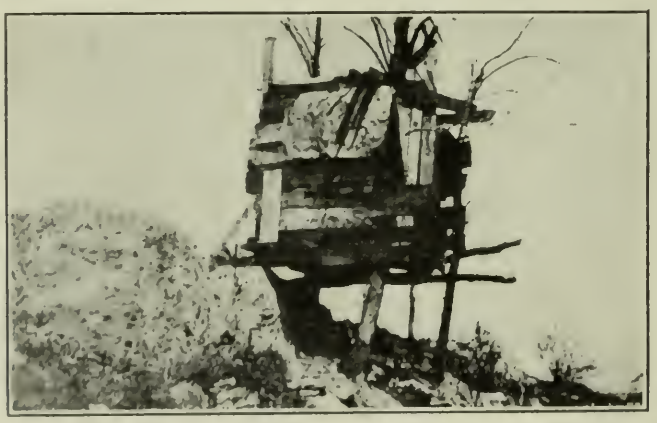


Fig. 11.—A photograph of an insanitary privy used by about 30 persons and located within 300 feet of and on a quick-spilling watershed of a large water-cress bed.

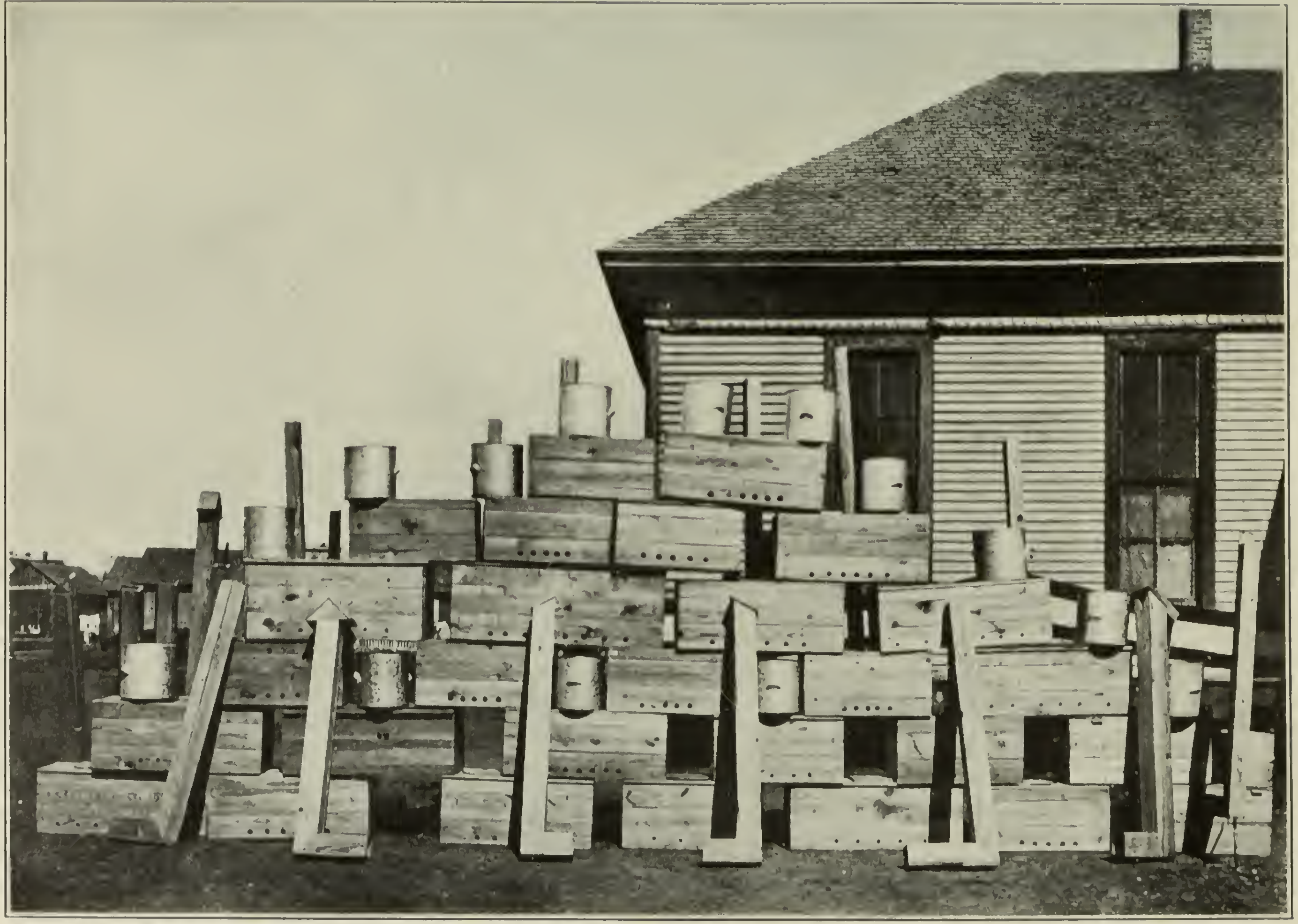


Fig. 12.—Sanitary privy boxes with flues and cans ready for installation in one of the towns surveyed in Hill County, Tex.

Fig. 13.—A group of residents in a town in one of the counties surveyed, at all of whose homes on the same day sanitary privies were installed through a cooperative plan of work.

each church in the county in which services are held preaches a sermon with sanitation as its theme. The support of the local physicians is highly important. One of the first meetings held in the county is with the local (usually county) medical society. With very few exceptions, practicing physicians can be counted on to give their support to these sanitation campaigns. Through the cooperation of the local newspapers excellent publicity is given to the work. In some instances articles for the newspapers are written by the men engaged in the survey, but the best publicity for the work as a rule is in the articles written as news by the newspaper people. An article which has been published generally in the local newspapers of the counties surveyed and which has been effective in bringing home to the people the importance of carrying out, before too late, the sanitary measures recommended, was written in 1915 by a member of the Public Health Service force, Field Investigator Quintard Taylor, and is presented as Appendix C, page 330 of this report.

Laboratory investigations.—From each county a number of samples of water from different sources of supply are collected and sent to a laboratory for bacteriological examination. In case of bored wells or of other sources of water supply protected against surface contamination, and in case of water supplies subjected to purification processes, the laboratory examination is important; but at the vast majority of the country homes and also of the town homes, the surface inspection gave sufficient evidence to warrant an opinion about the exposure of the water supply to contamination and the assistance of the laboratory was not necessary. Specimens of blood, feces, and urine are obtained from persons suspected to be cases of typhoid fever or carriers of typhoid infection, and sent to the laboratory for examination. The bacteriological examinations are as a rule made in the laboratory of one of the State boards of health or in one of the laboratories of the Public Health Service.

Investigation and bedside control of typhoid fever.—Special effort is made to learn of every case of typhoid fever in the county as soon as it occurs. Even in the county in which the reporting of cases of infectious disease is not required by law, the practicing physicians are earnestly solicited promptly to notify either the officer in charge of the work or the county health officer of cases of recognized or suspected typhoid fever, acute dysentery, and entero-colitis. Epidemiologic studies are made of the cases. With the assent of and usually in company with the attending physician, cases of typhoid fever are visited, the source of the infection searched for and the attendants of the patients are given detailed information[1] about measures to prevent the spread of infection from the sick. Persons living in homes in which typhoid fever exists or who otherwise are in close association with a typhoid fever patient or with a known typhoid infection "carrier," are advised to take antityphoid "vaccine." For each of the counties surveyed antityphoid vaccine furnished by the Hygienic Laboratory of the Public Health Service is offered without cost to all persons in the county who desire to be inoculated. The vaccine is administered by the practicing physicians (usually without charge) and by the county health officer. The occurrence of typhoid fever or of other intestinal infections (including especially the fatal diarrhoeas of infancy) in a neighborhood is exploited as evidence of the serious and immediate need of carrying out at the homes in that neighborhood the sanitary measures recommended.

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[1] Public Health Bulletin No. 69, pp. 19 to 22.

Towns and villages.—In a crowded center of population, such as a town or village, an equivalent degree of insanitation is a greater menace to health than in an equal number of homes in a sparsely settled country neighborhood. Insanitary towns and villages constitute important foci from which infection is spread to country homes in their vicinity. A demonstration of sanitary improvements in the towns will influence persons living in surrounding country neighborhoods to effect similar improvements at their homes. For these several reasons the work at the beginning of the survey as a rule is concentrated in the towns and villages, including industrial settlements such as cotton-mill villages and mining camps. The usual sequence of the work in a town is (1) to appear before an open meeting of the town council and present to the members thereof and to interested citizens who may attend the meeting, the general principles of sanitation which appear to be most applicable to the town; (2) to make a survey of the town to ascertain in detail (*a*) the character of the public and the private sources of water supply, (*b*) the methods of collection and disposal of human excreta, garbage, and stable manure, (*c*) the protection of milk and other food supplies against potentially dangerous contamination, (*d*) the prevalence of preventable disease, and (*e*) the efficiency of the local health organization; (3) to report to the town council and to mass meetings of citizens the findings from the survey and methods needed for the correction of insanitary conditions; (4) to encourage existing civic organizations (and in some instances to encourage the formation of special organizations of citizens) to support the program of sanitation indicated; and (5) to assist in the drafting of needed ordinances and to encourage the passing of same as soon as popular sentiment seems sufficient to enable the town authorities to enforce them.[1]

The most serious fault usually found in the rural town or village is the insanitary method of disposal of human excreta at unsewered homes. The procedures recommended for the installation of sanitary privy systems in the towns and villages in the counties surveyed are described in Public Health Bulletin No. 89.[1]

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[1] A highly interesting account of the work in towns, written by Herbert Quick, and entitled "Uncle Sam Cleans up Springfield," was published in the Saturday Evening Post of Aug. 19, 1916.

Follow-up visits.—From time to time resurveys of the towns and villages are made and reports of progress and further needs of sanitation are made to the municipal authorities and, through newspaper articles and other agencies, to the citizens generally. A number of homes in each country neighborhood is revisited one or more times for the purpose of ascertaining the degree of sanitary improvements effected. In the follow-up visits to the country homes the following form-card is used:

U. S. PUBLIC HEALTH SERVICE.

SANITARY SURVEY.

State____________________________ County____________________________

Follow up visit, No. ____________

District No. ________________ Date______________________________

Name ____

Address____

Improvements since last visit in:

Excreta Disposal____

Water Supply____

Screening____

Definite promises____

Attitude____

Remarks____

____

____

Investigator.

Sanitary Score____________________________

If improvements have been made since the last visit of the investigator, the home is given a new sanitary rating, which is explained in terms of health protection to some responsible member of the household. The following circular letter is left at each home resurveyed, with the request that it be filled out and mailed to the officer in charge of the work if further sanitary improvements are made at the home:

OFFICER IN CHARGE, RURAL SANITARY SURVEY,
U. S. Public Health Service.

SIR: In reply to your recent inquiry you are informed that since the visit of your representative (———) to me on ——————, 191–, I have had the following sanitatary improvements made at my home:

1. New sanitary privy built?______________________________________ Yes. No.
2. Privy (type ———) made of sanitary type?___________________ Yes. No.
3. Systematic cleaning of privy every week (2 weeks, month)?______ Yes. No.

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[1] Entitled "A Sanitary Privy System for Unsewered Towns and Villages."

4. Water supply (well or spring) protected against surface contamination? ____ Yes. No.
5. Dining room and kitchen screened against flies?_______________ Yes. No.

(Signature) ________________________________,

Address ________________________________.

NOTE.—After each question scratch out "Yes" or "No," so the answer will show what has been done.

In each country neighborhood in the county a sufficient number of homes is revisited to furnish a fair index of sanitary progress at the country homes generally of the whole county.

In some of the communities a distinctive sign (referred to colloquially as "the sign of the times"), representing the corps device of the Public Health Service, has been stenciled conspicuously on new sanitary privies and on old privies converted into sanitary type. The use of this mark of sanitary distinction appears to have a good psychological effect. In the follow-up visits the investigators have opportunity to offer suggestions for better operation of the sanitary installations and, also, to study improved methods of rural sanitation.

Modifications.—Various minor modifications in the plan of work have been made from time to time, but the plan herein described was followed, in all essential details, in the 15 counties in which the surveys, and the reports thereon, already have been made.

Under the recent act of Congress (see p. 21) it is expected that a large proportion of the work will be conducted on a cooperative basis. On this basis the unit of the working force for the average county will be a whole-time county health officer, a whole-time health nurse, and one or two whole-time sanitary inspectors. The salaries and official expenses of the personnel will be paid in part by the National Government and in part by the State or the county government, or both. In this way the activities of the National, State, and county health organizations will be coordinated in work on the intrastate and interstate problem of rural sanitation.

Three modified plans of the work have been or are being tried out—one (*a*) in Edgecombe County, N. C., one (*b*) in a group of towns in Wyoming, and one (*c*) in Mason County, Ky., and in the extra-cantonment areas.

In Edgecombe County an officer of the Public Health Service is making a practical study of county health work. He is serving as whole-time health officer for the county. All expenses incident to the work except the salary of the officer are borne by the county. The purposes of the study in Edgecombe County are (1) to determine standard methods for conducting county health work, and (2) to ascertain what can reasonably be expected in the way of sanitary advancement in a county from the whole-time services of one man with reasonably adequate qualifications for county health work.

In Wyoming, a medical officer and a sanitary engineer of the Public Health Service, constituting a unit of workers, are making an intensive study of sanitary conditions in a group of twenty or thirty rural towns and villages. Their work is along the same general lines as those followed in the surveys of whole counties, but is confined to towns and villages. Country homes in the vicinities of the towns are surveyed in sufficient number, only, to obtain an indication of the sanitary needs of the country neighborhoods. This plan of work appears particularly suited to sections of the country in which most of the population is in towns and in which the strictly rural districts are very sparsely settled. The purpose of the plan of work started in Wyoming is to determine the degree of advancement in sanitation and in health protection which can be accomplished in counties by work confined largely to the towns and villages as compared with that which can be accomplished by work, relatively much more expensive, which is extended to all homes—town and country—in counties.

In Mason County, Ky., and in the extra-cantonment areas, a cooperative plan of work has been followed, and the demonstration phase of the work has been stressed. In the spring of 1917, the citizens of Mason County raised by popular subscription $3,300 to be used "for demonstration work in rural sanitation" in the county. This fund was turned over to the State Board of health, and was supplemented by an equal amount for the same purpose allotted by the State board of health of Kentucky from its annual appropriation. Thus, from county and State sources the sum of $6,600 was made available for use in cooperation with the Public Health Service in the demonstration work in Mason County. The investigative and educative phases of the work in this county have been the same as those in the counties surveyed in 1916; but in Mason County a radical departure has been made to apply a demonstration phase of the work. With the joint fund of money available, necessary equipment was obtained and sanitary inspectors and laborers were employed for the performance of the actual work of installation of sanitary improvements at the farm homes. The investigators in the course of their visits of survey to the homes, instead of leaving the families to do the best they could for themselves toward obtaining material, equipment, and expert labor to make the sanitary improvements indicated, were able to tell the property owners that if they desired to come in on the cooperative plan a force of trained men with proper equipment would be sent to their homes at the appointed time to furnish expert assistance in making the installations. It was stipulated that all material—including cement, sand, rock, lumber and vent piping—was to be furnished by the property owner. As soon as possible after notification that the material was on hand, and requests were received by the County Health Officer from the owners of as many as 10 dwellings in one neighborhood, a force would be sent to that neighborhood to assist in accomplishing the demonstration. Immediately following the beginning of the survey, the number of requests from property owners became, and unto this time has continued to be, overwhelming. The supply of available trained labor was far from sufficient to meet the demand. In the summer and fall of 1917, about 300 high-grade Kentucky type of L. R. S.[1] privies were installed in Mason County. When the cold weather of winter necessitated a discontinuance of the work, the owners of about 500 other homes were ready and waiting to do their part in the cooperative work. It is hoped that arrangement may be made so that the work can be resumed in the spring of 1918. If the work can be continued under proper auspices, the prospects are good for Mason County to furnish the most impressive demonstration of county-wide sanitation ever accomplished.

In the extra-cantonment areas the plan of work is similar to that in Mason County. In the areas in which the Public Health Service is now conducting rural sanitation work, the officials of each county involved in the areas have made appropriations for use in cooperation with the Public Health Service. Each area comprises a zone five miles wide around the cantonment. In some of these zones parts of two or three counties are involved. Of each county comprised in part in the extra-cantonment zones, the county officials have appropriated a sum ranging, according to the extent of the section of the county involved, from a few hundred to $6,000. In every one of the extra-cantonment areas the rural sanitation work has gone forward in a highly gratifying manner. In some of them the prospects are that in the near future every rural dwelling within a radius of five miles of the encampments will have been equipped with a sanitary privy and with other means for safeguarding the health both of the soldiers and of the civilians in the community. Thus, in the extra-cantonment areas, the rural sanitation work of the Public Health Service is serving to accomplish not only its usual purposes, but also to prevent sickness, with physical incapacity and deaths, among our soldiers, and, thereby, is helping in an inconspicuous but important way to win the war.

DIRECTION OF THE WORK.

The rural sanitation work of the Public Health Service, being largely of an investigative character, is administered through the Division of Scientific Research in the Bureau of the Public Health Service. The officer in general charge of the field operations, throughout the period of the surveys covered in this report, was attached to and had his office in the central laboratory of the Public Health

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[1] Public Health Bulletin No. 68, pp. 19 to 24.

Service, the Hygienic Laboratory, in Washington, D. C. From time to time he made visits of inspection to the counties in which the work was in progress and to communities in which inauguration of the work was contemplated. This officer usually remained in each county during the period of a week or 10 days, when the preliminary arrangements for the survey were being made, so that he could see to having the work, under the local conditions obtaining, conform to the general plan. In the divisions of Chemistry, Bacteriology, and Zoology of the Hygienic Laboratory problems developed by the field studies of rural sanitation have been and are being studied. Thus, at the Hygienic Laboratory the field and the laboratory phases of the study of conditions affecting rural health in all parts of the country are advantageously brought together. In each county in which the field studies were being conducted, the senior officer of the Public Health Service among those composing the survey party for the county was, in the absence of the officer in general charge of the field studies of rural sanitation, in immediate charge of the work. At the Marine Hospital in St. Louis, Mo., a field laboratory for rural sanitation studies was maintained. Through the officer in charge of the Marine Hospital at St. Louis, acting as executive officer, some of the routine official correspondence from counties surveyed in the western and southwestern parts of the country was transmitted.

With the development of the work already realized and with the opportunities for advantageous enlargement of the operations in this important field of rural sanitation, the need of a Division of Rural Sanitation in the Bureau of Public Health Service has been obvious and legislation contemplating the establishment of such a division has been under consideration. Such division could serve not only as an administrative office for the rural sanitation work of the Public Health Service but also as a clearing house for studies in rural sanitation conducted by all the different agencies—National, State, and local—in this important field.

FINDINGS.

The findings at the homes surveyed in 15 fairly representative rural counties of the United States furnish a large collection of definite data which should be of value to all American citizens who are interested in the subject of rural sanitation; and, because of its vital and far-reaching importance, all of our people with fair intelligence should be interested in this subject. The detailed findings in the different counties are presented in the sections of this report describing separately the surveys of the counties, and a condensed statement of findings is presented in the general summary, page 43.

With these facts now before us we no longer have to estimate what the sanitary conditons iin our vast rural territory are, but we can state them definitely. Briefly stated, the sanitary conditions in the rural districts generally of the United States are grossly faulty and susceptible to and seriously in need of correction (figs. 8, 9, 10, and 11).

Some of the more salient conditions found.—Of 51,544 farm homes surveyed, only 1.22 per cent were equipped for the sanitary disposal of human excreta—and at some which were properly equipped, the equipment was not used by all members of the household in a sanitary manner; at 68 per cent, the water supply used for drinking and culinary purposes was obviously exposed to potentially dangerous contamination from privy contents or from promiscuous deposits of human excreta, and at the majority of these the water supply was exposed also to unwholesome pollution from stable yards and pigsties. At only 32.88 per cent of the farm homes were the dwellings during the summer season effectively screened to prevent flies—having free access to near-by deposits of human and other filth—from entering the dining rooms and kitchens and contaminating the foods for human consumption exposed therein. No stretch of the imagination is required for a realization, on common-sense grounds, of the significance of such conditions. They are bad—bad for the human body and bad for the human mind.

Knowledge of sanitation.—In the vast majority of the families visited the responsible members of the household were uninformed or misinformed about the most salient features of home sanitation. In many instances at the homes of the most prosperous and the most progressive farmers in a neighborhood, with dwelling houses handsomely constructed and elaborately adorned with lightning rods, the worst sanitary conditions were found.

Even among families in which cases of typhoid fever had occurred within the last 12 months it was very exceptional to find that sanitary measures approaching effectiveness had been carried out to protect the family against a recurrence of the disease.

In the course of the house-to-house visits the person interviewed was asked for an expression of opinion about the cause of typhoid fever, how this disease is spread, and why people have it. Typhoid fever was selected for this purpose because it prevailed in all counties surveyed and because it was familiar to and talked about by the people generally in all the neighborhoods visited. The answers to this question presented a remarkably interesting variety. Some said "the Lord sends typhoid fever," others said "the devil brings it," and between these two extremes there were answers ranging as widely as one who is acquainted with the cause and the modes of spread of typhoid fever could imagine.

Taking as an example one of the counties which presented social, economic, and general educational conditions considerably above the average of the 15 counties surveyed, the answers given by the heads of households at the farm homes to the question, "What, in your opinion, is the cause of typhoid fever?" were as follows:

(1) At 83 homes in which one or more cases of typhoid existed at the time of the inquiry, or in which cases had existed within the few weeks immediately preceding the time of the inquiry—

Answer.	Number of persons answering.
Don't know	64
Water	12
Visiting neighbors	2
Dirty dishes	1
Nursing typhoid	1
Run-down system	1
Fate	1
Germs	1

(2) At 2,512 representative rural homes in which cases of typhoid fever had not developed within the 12 months immediately preceding the time of inquiry—

Answer.	Number of persons giving answer indicated.
Don't know	951
Water	581
Dirt, dirty dishes, dirty floors	318
Germs	253
Flies	102
Run-down system	31
Billiousness	29
Marshes	27
Milk	23
Stomach trouble	16
Mosquitoes	14
Air	12
Excreta	12
Bad privy or cesspool	12
Chills	12
Green fruit	11
Fate	9
Hot sun	8
People spread it	8
Colds	6
Nursing typhoid	6
Exposure to bad or wet weather	5
Bad blood	4
Hereditary	4
Malaria	4
Dissipation	4
Bathing while blood was hot, or in bad or cold water	4
Hard work	4
Going barefoot	2
Watermelon	2
Visiting neighbors	1
Damn laziness	1
Frogs	1

Answer.	Number of persons giving answer indicated.
Quicksand	1
No purgative taken	1
Hit on head	1
Fever in blood	1
Bad meat	1
Vegetables	1
Worry	1
Rats	1
Poor drainage	1
Pain in back	1
Rotten manure	1
Schools	1
Hog pens	1
Crabs	1
Breathing other people's breath	1
Cabbage	1
Heat in summer	1
Dampness in house	1
Bad sanitation	1
Tree roots in wells	1
Dirty beds	1
Rubbish	1
Weeds	1
Bad smells	1
Oysters	1
Eating fruit	1
Bad sewerage	1
Crowded conditions	1
Dirt in henhouse	1
Caring for sick people	1
Going to church	1
Mental suggestion	1
Tearing down old houses	1
Hot strawberries and green apples	1
B. typhosus[1]	1

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[1] Answer given by a graduate in medicine.

This rather startling finding, particularly in so far as it applies to the homes at which cases of typhoid fever existed at the time of the interview, indicates that our practicing physicians generally, in recent years, have not been accomplishing much in the education of their clientéle along lines for the prevention of the more common infectious diseases.

Popular attitude toward sanitary measures suggested.—At only 91, or 0.17 per cent, of the 51,544 farm homes visited did the investigators fail to meet with a reasonably cordial reception. The people generally expressed their approval of the plan and of the purposes of the survey, cooperated in the studies and appeared anxious to obtain suggestions about the measures needed for correction of insanitary conditions at their homes (figs. 12 and 13). Such little opposition as was met with appeared invariably to be based on some religious conviction or on the fatuous belief that "man can live unto himself alone."

RESULTS.

The immediate results of the work in the way of sanitary improvements and disease reduction in the 15 counties surveyed are presented in the general summary and in the sections for the different counties of this report. In view of the fact that this work was quite strictly of an investigative character and that the educational phase of it was incidental to the purposes of the investigation, the immediate tangible results are highly significant. They appear to indicate what may be accomplished in sanitary advancement in the rural districts generally of the United States by prolonged, intensive, and reasonably directed efforts.

In the 15 counties surveyed it is reasonable to expect that progressions and retrogressions in sanitation from time to time will occur. But the result in these counties appears to be a permanent contribution to the cause of rural sanitation. The educational result, incident to the extensive publicity given the work, is largely intangible, and its full value can be imagined only vaguely.

An important result of the work has been the acquirement of training in the salient details of rural sanitation by the men engaged in performing the detailed work of the surveys. To the zeal, enthusiasm, energy, and intelligence of these men such success as the studies have had, or will have, is largely due.

SUMMARY.

A summarized statement of (1) the extent of the work, (2) the more salient findings, and (3) the immediate results of the work in the 15 counties surveyed is presented in the following three tables (I, II, and III):

TABLE I.—*Extent of work.*

County.	Survey begun.	Survey terminated.	Number of country homes canvassed and surveyed.	Number of town homes canvassed and surveyed.	Number of homes in industrial settlements canvassed and surveyed.	Total homes canvassed and surveyed.	Number of country homes revisited.	Number of public lectures.	Approximate number of persons attending lectures.
Berkeley, W. Va	Apr. 1, 1914	Nov. 15, 1914	2,318	2,850	159	5,327	455	38	3,420
Lawrence, Ind	May 7, 1914	do	3,549	552		4,101	480	35	5,000
Union, Miss	June 16, 1914	do	2.995	555		3,550	442	40	3,950
Dorchester, Md	July 10, 1914	do	4,091	2,260		6,351	1,927	35	5,600
Anne Arundel, Md	Apr. 21, 1915	Oct. 1, 1915	7,543	317		7,860	1,844	42	2,100
Wilson, Kans	Apr. 23, 1915	Oct. 15, 1915	2,320	2,070	(1)	4,390	300	22	1,430
Orange, N. C	May 1, 1915	Nov. 6, 1915	2,486	763	(2)	3,249	1,156	72	6,764
Walker, Ala	May 10, 1915	Nov. 1, 1915	2,592	2,105	2,295	6,992	[3]3,299	71	11,000
Dallas, Iowa	June 14, 1915	do	2,409	3,555	274	6,238	500	26	2,600
Greenville, S. C	Mar. 8, 1916	Nov. 1, 1916	8,752	[4]758	2,241	11,751	2,006	123	24,600
Floyd, Ga	do	do	3,610	2,575	587	6,772	[5]2,614	111	12,876
Tuscaloosa, Ala	Mar. 9, 1916	Oct. 30, 1916	1,010	1,255	353	2,618	[6]918	68	4,000
Obion, Tenn	Apr. 12, 1916	Nov. 3, 1916	3,229	1,630		4,859	2,006	80	11,658
Clay, Mo	July 8, 1916	Nov. 21, 1916	2,262	2,184		4,446	500	49	3,500
Cumberland, Ill	Aug. 15, 1916	Dec. 4, 1916	2,378	920		3,298	1,192	53	3,710
Total			51,544	24,349	5,909	81,802	19,639	865	105,208

[1] Included with town homes.
[2] Included with rural homes.
[3] Includes 2,295 homes in industrial settlements.
[4] Exclusive of Greenville.
[5] Inclusive of industrial settlements.
[6] Exclusive of industrial settlements and inclusive of farm homes only.

TABLE II.—*Findings on original survey.*

County.	Percentage of country homes without toilets of any kind.	Percentage of country homes with insanitary privies.	Percentage of country homes with grossly insanitary disposal of human excreta.	Percentage of country homes with sanitary privies or with sanitary sewer systems.	Percentage of country homes with water supply regarded as unsafe.
Berkeley, W. Va	13.00	86.76	99.76	0.24	67.20
Lawrence, Ind	23.00	76.75	99.75	.25	56.00
Union, Miss	73.82	25.98	99.80	.20	76.15
Dorchester, Md	31.98	66.94	98.92	1.08	36.50
Anne Arundel, Md	10.85	78.98	[1]94.35	5.65	48.41
Wilson, Kans	10.69	88.15	98.84	1.16	33.05
Orange, N. C	67.94	[2]31.98	99.92	.08	95.65
Walker, Ala	[3]47.05	44.83	91.88	8.12	72.36
Dallas, Iowa	1.83	95.46	97.29	2.71	40.00
Greenville, S. C	42.73	56.88	99.61	.39	93.42
Floyd, Ga	38.00	60.19	[4]98.19	1.80	79.00
Tuscaloosa, Ala	28.71	71.41	99.12	.79	56.00
Obion, Tenn	33.42	66.36	99.78	.22	71.79
Clay, Mo	16.34	82.99	99.33	.67	69.93
Cumberland, Ill	23.59	76.24	99.83	.17	55.00

[1] This percentage includes 200 homes with water-closets discharging into insanitary cesspools.
[2] Includes 16 water-closets, effluents from which were disposed of in insanitary manner.
[3] Computed from all rural homes. Of the farm homes less than 20 per cent were provided with toilets.
[4] Exclusive of industrial settlements.

TABLE II.—*Findings on original survey.*—Continued.

County.	Percentage of country homes without screening of doors or windows in summer.	Percentage of town homes with water-closets connected with sanitary sewer.	Percentage of town homes without water-closets or privies.	Percentage of town homes with insanitary privies.	Percentage of town homes with sanitary privies.	Percentage of all homes in county having sanitary disposal of human excreta.
Berkeley, W. Va	26.70	[5] 10.52	....	73.68	....	0.11
Lawrence, Ind	26.62	23.00	....	77.00	....	11.76
Union, Miss	76.00	27.92	....	72.08	....	3.92
Dorchester, Md	32.14	20.03	0.09	78.62	1.26	5.37
Anne Arundel, Md	28.00	83.34	....	16.66	....	22.20
Wilson, Kans	2.48	44.88	.82	54.15	.14	22.07
Orange, N. C	80.00	16.25	9.69	73.67	.39	3.96
Walker, Ala	75.00	11.12	6.46	68.36	14.06	13.26
Dallas, Iowa	2.14	18.34	3.60	77.78	.28	11.49
Greenville, S. C	57.76	[6] 6.33	[6] .26	[6] 86.82	[6] 6.59	[7] 27.92
Floyd, Ga	79.96	77.71	.19	22.10	....	43.91
Tuscaloosa, Ala	62.80	[8] 66.20	[8] 1.67	[8] 32.13	....	[9] 5.12
Obion, Tenn	36.40	12.14	5.45	82.41	....	4.22
Clay, Mo	14.01	33.77	1.42	64.26	.55	17.18
Cumberland, Ill	10.18	....	3.91	95.99	.10	.15

[5] The water-closets discharged into private sanitary sewers which emptied into a storm sewer. The storm sewer near the center of the city emptied into an open stream. Therefore this percentage of homes could not be regarded as having sanitary disposal of human excreta. Seventeen and nine-tenths per cent of the homes in the city had water-closets which discharged into insanitary cesspools.

[6] Exclusive of Greenville City.

[7] Inclusive of Greenville City.

[8] Inclusive of all homes in Tuscaloosa City.

[9] Computed on findings only at the 2,618 homes canvassed and surveyed.

TABLE III.—*Sanitary improvements resulting immediately from Survey.*

County.	Percentage of country homes at which sanitary privies were installed.	Percentage of country homes at which privies were markedly improved in construction but not converted into strictly sanitary type.	Percentage of country homes at which improvement was made in water supply.	Percentage of town homes having privies at which privies were cleaned and disinfected.	Percentage of town homes having privies at which water-closets or sanitary privies were installed in place of insanitary privies.	Per centage of town homes having privies at which privies were markedly improved but not converted into strictly sanitary type.	Estimated percentage of total homes in county having sanitary disposal of human excreta.	Typhoid-fever reduction.[1]
Berkeley, W. Va.	9.40	12.00	16.48	100.00	19.00	23.80	12.00	Very marked.
Lawrence, Ind..	9.00	27.09	5.35	69.73	69.73	....	40.16	Marked.
Union, Miss.....	6.50	.45	5.00	100.00	100.00	....	16.98	Do.
Dorchester, Md.	17.00	13.60	8.00	100.00	42.17	34.69	28.79	Very marked.
Anne Arundel, Md.	25.38	15.67	11.00	6.00	91.66	....	39.36	Slight.
Wilson, Kans...	8.81	13.16	30.00	100.00	69.87	4.66	44.64	Marked.
Orange, N. C....	11.42	3.55	11.33	100.00	85.85	1.25	32.75	Do.
Walker, Ala.....	[2] 11.23	[2] 10.00	5.80	98.00	71.57	13.51	37.07	Very marked.
Dallas, Iowa....	7.80	15.60	10.80	....	....	5.00	14.51	Slight.
Greenville, S. C.	14.70	5.19	5.00	100.00	100.00	....	49.48	Marked.
Tuscaloosa, Ala.	[3] 59.09	[3] 3.46	[3] 10.00	100.00	99.35	....	[4] 88.69	Very marked.
Floyd, Ga.......	[6] 7.61	[6] 3.78	6.08	35.51	4.97	34.90	52.98	Marked.
Obion, Tenn....	5.18	3.74	1.20	50.00	48.58	5.00	21.98	Do.
Clay, Mo........	9.60	6.00	4.60	62.00	48.09	2.00	36.75	Slight.
Cumberland, Ill.	11.00	6.00	5.50	35.00	28.87	....	15.74	Not yet determined.

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[1] In the year of the survey, or in the months of that year after the survey was started, 584 cases and 38 deaths from typhoid were noted, as against 1,503 cases and 123 deaths for the same period of the previous year. This is a reduction of 61 per cent in cases and 69 per cent in deaths.

[2] Includes improvements at industrial settlements in rural sections.

[3] Computed on the findings only at the 1,363 rural homes surveyed.

[4] Computed on findings only in area surveyed comprising Tuscaloosa, Northport, and 1,563 rural dwellings.

[6] Exclusive of industrial settlements.

CONCLUSIONS.

From the observations in these 15 fairly representative rural counties in the United States the following conclusions seem warranted:

1. Rural sanitation is needed.
2. Rural sanitation is feasible.
3. The cost of work necessary to secure marked advancement in rural sanitation is many times less than the cost of the illness and of the physical inefficiency which will be prevented by such advancement; and, therefore, prolonged, intensive, reasonably directed work for the advancement of sanitation in the rural districts generally of the United States would prove economic.

SANITARY SURVEY OF BERKELEY COUNTY, W. VA.

The first county in which the plan of work described in this report was undertaken was Berkeley County, W. Va. That county was among the first selected because it appeared to present fairly representative sanitary, economic, and social conditions for the general section of the country within which it is located and because it had a high annual rate of prevalence of typhoid fever.

A request for the survey was received from the local and State officials, including the State Board of Health, the County Board of Health, and the Board of Health of Martinsburg, the principal town and the seat of government of Berkeley County.

The survey of Berkeley County was begun on April 1 and terminated on November 15, 1914.

Before the beginning of the complete survey a preliminary survey was made (in the fall of 1913) by Asst. Surg. Glanville, under the direction of Surg. Lumsden.

In the preliminary survey attention was directed particularly to water supplies, disposal of human excreta, and to typhoid-fever histories of families. This preliminary survey was conducted in three different sections of the county, and all told 511 homes were visited. In the majority of these homes the water supplies used for drinking purposes were obviously exposed to potentially dangerous pollution. At 86 of the homes no toilets of any kind were in use. Of all privies found in the 511 homes, only one was of sanitary type. At 271 of the homes at which there were privies the privies were used only by the women and children, the men on these places resorting to stables or woods to void their excretions. Of the 2,329 persons residing in the 511 homes canvassed, 191 (or 8.2 per cent) gave a history of having had typhoid fever, 30 (or 1.28 per cent) within the calendar year of 1913.

The findings from this preliminary survey made it clear that there was in the rural homes in Berkeley County serious need of sanitary improvements and that "due to the faulty sanitary conditions" the typhoid-fever rate was high.

The citizens generally presented a cooperative spirit in the investigation, and the situation in the county, as a whole, seemed favorable for a complete sanitary survey of the county.

GENERAL CONDITIONS.

Berkeley County is located in what is known as the "Eastern Panhandle" of West Virginia. It lies between the thirty-ninth and the fortieth parallels of latitude and between the seventy-seventh and the seventy-ninth meridians of longitude. The whole county forms a part of the drainage shed of the Potomac River, which river forms the northern boundary of the county. The county has a land area of 325 square miles.

The greater part of the county is hilly, and extending the length of the county from north to south is a mountain range known as "Little North Mountain." About one-third of the land area lies to the west of this mountain range and two-thirds to the east of it.

The soil formation generally throughout the county is limestone. The limestone stratum outcrops in many places and the stratum overlying it is clay and loam. The soil is fertile and for the county as a whole in a good state of cultivation. Apple orcharding is an important industry. Corn, wheat, and hay are the staple crops.

According to the census reports the population of the county in 1910 was 21,999, of which 10,698 lived in Martinsburg and 11,301 in the rural sections.

The only incorporated town besides Martinsburg is Hedgesville, with a population of 328. The rural population, per square mile, is given at 34.8. The only races residing in the county are white and negro. 20,198 being white and 1,801 negro. Only 344 of the population are foreign born. The percentage of illiterates in the county is given at 7.

Two railway lines traverse the county, namely, the Baltimore & Ohio and the Cumberland Valley.

Most of the public roads are improved, and are kept in reasonably good condition with money obtained by a toll-gate system. Most of the improvement of the roads has been made by private corporations.

The principal industries of the county are farming, orcharding, and limestone quarrying. Water cress and apples are the principal food supplies which are produced in the county and shipped extensively to places outside West Virginia.

PLAN AND SCOPE OF SANITARY SURVEY.

The complete sanitary survey of the county, begun on April 1, 1914, comprised a visit to practically every home in the county.

During the first month of the survey, seven officers of the Public Health Service constituted the working force and after that the number of men on the force averaged three.

Most of the rural homes within the county were reached in the first month of the work. Surg. Lumsden was in general charge of the work and during his absence Asst. Surg. R. M. Grimm was in immediate charge for the first month and Asst. Surg. W. M. Bryan for the remainder of the working period.

In the course of the survey endeavor was made to ascertain by careful questioning the history of each family in respect to the incidence of disease in general and of typhoid fever in particular. The survey of the premises was made usually in company with some member of the household; the head of the family whenever practicable.

Attention was directed especially to human excreta disposal, stable manure disposal, water supplies, and the protection of foods from flies by screening or other measures. Literature on excreta disposal, water supplies, typhoid fever, and other appropriate subjects was freely distributed.

Public lectures were given from time to time in different neighborhoods. These were usually illustrated by stereopticon slides. In the course of the work 38 such lectures were given. The attendance at the lectures averaged about 90.

On the request of the city authorities the survey was extended to Martinsburg. Though Martinsburg is not rural, the sanitary conditions in Martinsburg have had a distinct bearing on the health of the people residing in the rural sections of the county.

Headquarters were established in the courthouse in Martinsburg.

Circular letters were sent to the families throughout the rural districts explaining the plan and purpose of the work. Upon request, bulletins on sanitary subjects were sent by mail to the citizens. The local newspapers rendered most valuable assistance. The news of the sanitary survey was usually given front-page prominence. The writer knows of no better local publicity for health work than that which was given by the newspapers of Martinsburg throughout the period of the survey. The number of rural dwellings covered by the survey was 2,477 and the number of urban dwellings (all in Martinsburg) covered by the survey was 2,850. Besides the canvass and survey of homes, sanitary inspection was made of schools, churches, post-offices, railroad stations, and stores, and reports of findings at these public places were made to the persons responsible. Four hundred and fifty-five rural homes, selected as fairly representative of all the rural homes in the county were revisited one or more times to ascertain the degree of sanitary improvements effected by the educational work.

The public generally manifested a hearty spirit of cooperation in the studies. In the course of the house-to-house visits the investigators failed to meet with a reasonably cordial reception in only one instance.

FINDINGS IN RURAL SECTIONS.

With the exception of about 175 dwellings situated in three residential villages and about 150 dwellings in five industrial settlements (limestone quarries), all the homes in the county, outside Martinsburg, are more or less isolated country homes.

Of the 2,477 dwellings visited in the rural sections, 123 were unoccupied, leaving 2,354 rural homes, at most of which fairly complete data were obtained.

Race.—Two thousand and fifty-four families were white, 154 negro, and for 146 the race of the family was not recorded.

Number in household.—The number of persons in 2,330 homes at which the number in the household was enumerated was 11,082: Thus, the average for each home in the rural sections of the county was 4.7.

Number of rooms to house:	Dwellings.
With 1 room	16
With 2 rooms	171
With 3 rooms	120
With 4 rooms	437
With 5 rooms	342
With 6 rooms	468
With 7 rooms	212
With 8 rooms	289
With 9 rooms	107
With 10 rooms	76
With 11 rooms	30
With 12 rooms	16
With over 12 rooms	23
	2, 307
Not stated	170
Total	2, 477

Construction of house:	
Stone or brick	197
Frame	1, 807
Log	340
	2, 344
Not stated	133
Total	2, 477

General cleanliness of premises.—This applies to rubbish, such as waste paper, rags, ashes, tin cans, and leaves, to garbage and other kitchen refuse, to litter from stables, pigsties, and chicken pens scattered about the yard, and to obvious collections of dirt or dust inside the dwelling.

The general cleanliness appeared to be good for 1,323 homes, fair for 673, poor for 358, and for 123 it was not recorded.

Cellar or basement.—One thousand six hundred and ninety-nine homes had cellars or basements, 655 had none, and for 123 the presence or absence of a cellar was not recorded.

Screening.—Eight hundred and twenty-four homes were completely screened; 981 were screened in part, so as to exclude probably 50 per cent of the flies seeking admission; 663, or 26.7 per cent, were entirely devoid of screening, and for 9 the presence or absence of screening was not recorded. The presence or absence of screening was recorded in respect to the summer season only.

Topography.—Nine hundred and thirty-six of the homes were located on sloping ground, 1,264 on hilly ground, 120 on flat ground, and for 157 the topography was not recorded.

Drainage from near-by premises.—Six hundred and seventy-three of the premises were downhill from and obviously received surface drainage from yards, stables, privies, pigsties, chicken pens, or other sources of pollution located on near-by premises.

Animals on premises.—At 1,270 of the homes cows were kept; at 1,440, horses; at 1,540, hogs; at 1,955, chickens; at 1,440, dogs; at 1,252, cats.

At only 6 of all the rural premises in the county was provision made to prevent stable manure from serving as a breeding place for flies.

Disposal of human excreta.—Definite data on the methods of disposal of human excreta were obtained for 2,436 households. Of all the rural homes in the county only 6 (or 0.24 per cent) were provided with sanitary devices for the collection and disposal of human excreta. Of these 6, 5 were provided with water-tight receptacles and of fly-proof construction, and 1 was provided with a flush water-closet, the effluent from which was discharged into a septic tank and thence into the subsoil in a sanitary manner. Of the remaining 2,430 rural homes, 15 were provided with privies with water-tight receptacles but not fly-proof construction; 145 with pit privies, few of which were protected against invasion by flies and almost all of which seriously endangered water supplies used for drinking purposes; 765 were provided with surface privies which were boarded up at the back and sides so as to exclude large animals, but not so as to exclude flies; 1,153 were provided with open-in-back surface privies, the contents of which were thoroughly exposed to flies, large animals, and surface drainage; 24 were provided with flush water-closets which discharged into insanitary cesspools; and at 328 (or 13.4 per cent) there were no toilets of any kind, the members of the household resorting to stables or near-by woods to void their excretions.

Of the 2,108 homes at which there were toilets of some kind, the toilets were used by all the members of the household at 1,479. For the remainder, the toilets were used habitually by the women, or the women and children, only.

At 2,102 of the homes at which privies were in use, it was stated that at 1,293 the privy contents were removed when necessary and buried. For the remainder, the privy contents were either thrown into near-by fields or the removal of the same was left to chickens and other animals and to drainage.

Water supply.—Definite data in respect to water supplies used by members of the household for drinking purposes were obtained at 2,277 of the homes. Of these homes, 520 obtained water from springs; 1,243 from wells; and 514 from cisterns. Of these 2,277 water supplies, 1,530 (or 67.1 per cent) were obviously exposed to pollution from human excreta or other refuse matter and were regarded by the investigator as unsafe; 747 were regarded by the investigator as probably safe. In striking contrast with the opinion of the investigators in respect to the safety of the water supplies in use, was the opinion of the heads of the households. Definite statements of opinion on the character of the water supply were obtained from either the father or the mother or some other responsible member of the household at 2,257 homes. At 2,110 (or 93 per cent) the water supply in use at the home was regarded by the head of the household as being safe, and at only 147 was the water supply regarded by the users as either unsafe or questionable.

Of the 520 homes at which springs furnished the water supply, the spring was downhill from and exposed to drainage from stables or privies at 357 homes. Only 84 springs were protected from surface drainage by curbing or ditching.

At 19 homes water supplies were obtained from open polluted streams.

At the 514 homes at which cisterns were in use, 233 of the cisterns appeared to be water-tight and 281 were not; 462 of the cisterns were provided with pumps and 52 with buckets. A considerable proportion of those which were provided with pumps had over them loose platforms which exposed the water in the cisterns to contamination from the surface.

Of the 1,243 homes at which wells were in use, 399 had open-dug wells and 844 had bored wells.

The majority of the bored wells were provided with water-tight casings and with pumps so that they were protected against surface contamination; but on account of the limestone formation and of the sources of potential contamination on their drainage sheds, a considerable proportion of the bored wells furnished water, which from both surface indications and from the results of bacteriological examination appeared to be contaminated with human excreta.

Two hundred and seven of the wells were less than 20 feet in depth; 326 from 20 to 40 feet; 283 from 40 to 60 feet; 315 from 61 to 100 feet; and 112 over 100 feet in depth.

Considering the character of the water supplies in use, the nearness of wells, springs, and cisterns to insanitary privies and cesspools, and the soil formation, it appears certain that water has been an important factor in the transmission of typhoid fever infection in the rural sections of Berkeley County.

Rural villages and industrial settlements.—In the three villages, and at the five industrial quarries in the county, the sanitary conditions were found to be about the same as at the isolated country homes. On account of the greater density of population, however, the insanitary conditions in these settlements constituted, home for home, a greater menace to health than was the case in the country neighborhoods.

Water-cress beds.—Six large water-cress beds were found in the county. The cress cultivated from these beds was shipped mainly to large cities in Eastern and Middle West States.

The beds are located in valleys which are flooded with water. All of the cress beds except one were exposed to potentially dangerous pollution (fig. 11). On the water shed immediately over each of four of the cress beds were from 5 to 25 residences with open insanitary privies located within 160 yards of the beds and draining directly into them. One of these beds was exposed to drainage from a thickly settled neighborhood in which typhoid fever had been highly prevalent for several years.

Schools, churches, railroad stations, and post offices.—At all of these public institutions in the rural section of the county sanitary conditions were about on par with those at the country homes. None of them was provided with a anitary toilet and at most of them polluted water supplies were in use.

County health administration.—The health organization for the rural sections f the county consisted of a part-time county health officer who received for is services a salary of $100 a year. The incumbent, a practicing physician, hrough public spiritedness devoted much more time to health work than his alary as health officer warranted.

FINDINGS IN MARTINSBURG.

In Martinsburg there are about 2,850 homes. The land is hilly and the levation less than that of the immediately surrounding country. The older ections of the city are closely built up and in them the streets are narrow and generally there are no alleys separating the back yards of houses facing on parallel streets.

Excreta disposal.—The city had no sewerage system. There were found in use in the city 2,100 grossly insanitary privies. Of these about 700 were of the pen-in-back surface type and the remainder were of the "pit" type. The pits varied in depth from 1 to 8 feet. Most of them were dug into the limestone stratum in which there were seams. It required a long period for the average pit privy to become filled because most of the matter drained away through he seams in the limestone stratum and found its way either into the yards of neighboring premises or into open or underground streams. Some of the underground streams so polluted fed springs located within the city and used as sources of water supply for drinking purposes. No scavenger service was operated by the city and the cleaning of the privies was left to the judgment of individual householders. The average privy was not cleaned more often than once or twice a year.

About 800 homes were provided with flush water-closets. At about 500 of hese homes the water-closets discharged into cesspools and at the remainder he water-closets discharged into private sewers which discharged into a large torm sewer.

The cesspools were made by excavating into the limestone stratum and placing at the bottom of the excavation a charge of dynamite which, upon explosion, formed a seam in the limestone stratum through which the sewage was expected to disappear.

The storm sewer discharged near the center of the city into an open stream. Besides sewage this storm-sewer carried the waste from two large woolen mills. The waste from the mills, being acid, tended to lessen markedly the putrescibility of the sewage.

The stream, receiving the discharge from the storm sewer and the drainage from many privies and cesspools, overflows its banks in times of heavy rains, and grossly pollutes several public and private springs along its course.

Water supply.—The public water supply is owned by the municipality. About 32 per cent of the population used water distributed through pipes from the principal water supply. This supply is obtained from a large limestone spring located about three-fourths of a mile from the city. From the spring the water flows by gravity through a large terra-cotta conduit, which is not water-tight, to a pumping station in the city, from which the water is distributed by pressure to the homes throughout the city. This water supply, though rarely showing any easily noticeable turbidity, was constantly exposed to potentially dangerous pollution. The spring is fed by several underground streams on the sheds of which there are a number of farm homes. Several homes drained directly into the basin in which the spring is located.

At the time of the beginning of the survey there were a stable and an insanitary privy located within 60 feet of, and up a steep hill from the spring basin. Practically all of the contents of this privy were carried by drainage directly into the water in the spring. This privy was used by two families comprising altogether about 12 persons.

As the water flowed through the conduit from the spring to the pumping station it was further exposed to pollution from 8 or 10 homes located along the valley. The water was subjected to no purification process. This public supply of water was distributed to all sections of the city.

The other sources of water supply consisted of private wells and cisterns and public or private springs. There were three public springs located in the lower part of the city. These springs were obviously exposed to gross pollution from near-by privies and cesspools. To determine the character of the pollution of these springs, a test was made with uranine powder. One pound of uranine was placed in privy vaults from two to three hundred feet from the springs. Within two hours after so doing, the water in the springs became green, showing that there was free connection between the privy vaults and these springs. After this demonstration, warning notices were posted by the municipal authorities over these springs. Notwithstanding the demonstration and the warning notices, about 10 per cent of the people who had been using the water from these sources continued to do so.

Garbage collection and disposal.—The city operated a garbage collection service which reached the homes once or twice a week. The use of water-tight and fly-tight garbage cans was not required, and garbage from most homes was deposited along with dry refuse matter in open boxes, barrels or cans. The garbage and other refuse were hauled away in open wagons and deposited at refuse dumps located within the city. There were three such refuse dumps. The matter so deposited was very offensive to those living within the immediate neighborhood of the dumps and formed extensive breeding places for flies.

Stable manure.—There was no official supervision over the storage and removal of stable manure. The removal of this matter was left to the judgment and convenience of the owners of stables. At most of the stables large accumulations of manure, serving as breeding places for flies, were found.

The keeping of hogs and cows within the city was not prohibited, and at a large number of the homes filthy pig sties were found.

Milk and other food supplies.—The greater part of the milk supply of the city was obtained from farms located within a radius of 10 miles of the city. There was no official supervision over the milk supply. The care in the collection and distribution of the milk was left entirely to the individual judgment of the dairymen. The reporting of cases of infectious disease at the dairy farms was not required, and even when cases of infectious disease were generally known to exist on the dairy farms, nothing was done to discontinue the shipment of milk from such farms into the city.

On inspection, the dairy farms were found to present grossly insanitary conditions and faulty methods of handling the milk. At none of them was there a sanitary disposal of human excreta. At most of them polluted water supplies were used for washing the milk utensils. Dairy houses generally were unscreened and in the summer flies were abundant and passed freely from collections of filth to milk and milk utensils.

Ice cream, confectionery, fruits, and vegetables generally were exposed to flies, dust, and faulty methods of handling. Most of the places in which foods were sold or prepared for sale were unscreened and were freely invaded by flies coming from near-by collections of human excreta and other refuse.

A fairly extensive outbreak of typhoid fever in Martinsburg in the fall of 1913 appeared, according to such evidence as could be obtained, to have been caused by infection in a milk supply from a dairy farm at which cases of typhoid fever were known to exist. Although the conditions at this dairy farm at the time of the outbreak were known to some of the citizens of Martinsburg, nothing was done to interrupt the sale of milk from this dairy farm.

Health administration.—The health force of the city consisted of a part-time city health officer. His salary was $240 a year and the principal duties expected of him were in connection with the medical treatment of the city poor and of those incarcerated in the city jail. The reporting of cases of infectious disease in the city was not required. The only ordinances of the city pertaining to health dealt with nuisances, and practically none of these was enforced.

TYPHOID FEVER PREVALENCE.

In view of the topography, soil formation, and insanitary conditions obtaining in both the rural and urban sections, it is not surprising that the annual rate of prevalence of typhoid fever and of other diseases which result from filth-borne infection had been high in Berkeley County. Unfortunately, no accurate records of cases of, and of deaths from, infectious disease in the county had been kept. Of 11,082 persons enumerated in the canvass of the rural sections, 945 (or 8.4 per cent) gave a history of having had typhoid fever. Since it has been determined that a canvass, such as was conducted in the rural districts of Berkeley County, will succeed in obtaining histories of only about 60 per cent of the cases which have actually occurred, it is reasonable to conclude that the number of persons in the rural sections of the county who actually had had typhoid fever considerably exceeds the figure given.

For the three years immediately preceding the sanitary survey deaths from typhoid fever in the county, according to the incomplete reports, were as follows: For 1911, 13; for 1912, 12; for 1913, 19. These figures are probably too low. Accepting them at their face value, however, would give the county a typhoid-fever death rate of about 70 per 100,000 of population, which is several times as great as the average for the United States in these three years.

SANITARY MEASURES RECOMMENDED.

In carrying out the educational work for sanitary improvements the most salient features of sanitation were emphasized.

The measures recommended at country homes were (1) sanitary improvement in methods of disposal of human excreta, (2) protection of water supplies from potentially dangerous pollution, (3) protection of foods from filth, and especially from invasion by flies, and (4) the prompt institution of precautionary measures at the bedside of cases recognized as or suspected to be typhoid fever or other infectious disease.

In Martinsburg the measures recommended were (1) the treatment of the principal public water supply to make it safe and the abolishment of other sources (including polluted wells and springs) of water supply, (2) the sanitation of privies at once and the installation of a complete sanitary water-carriage sewerage system as soon as practicable, (3) the installation of garbage incinerators and radical improvement in the system of collecting garbage, stable manure, and other refuse, (4) adequate official supervision over milk supplies and other food supplies, and (5) requiring cases of and deaths from infectious disease to be reported promptly.

For both the county and the city a strengthening of the local health organizations was recommended.

COOPERATION.

Throughout the period of the survey the work was supported by the officials of the county and the city generally. The county health officer and the city health officer rendered active and valuable cooperation. A considerable item in the cost of the work was borne by the county, which furnished transportation facilities for the men to visit different parts of the county for the purposes of making quick surveys or resurveys of different localities and of addressing public meetings.

The practicing physicians of the county at a meeting formally indorsed the work and agreed, notwithstanding the lack of legal requirements, to make prompt report to the county health officer of cases of infectious disease occurring in their practice. The meeting with the physicians was held within the first few days of the work, and it seemed from that time on that remarkably complete reports of cases of typhoid fever and of other infectious disease were made to the health officer.

The school authorities actively supported the work. On two occasions the teachers of the county assembled in conference were addressed on the subject of school and home sanitation.

The clergymen gave their strong support to the program of sanitation recommended and practically all of them on one or more occasions within the period of the sanitary survey preached sanitation sermons from their pulpits.

The newspapers of the county carried out an excellent scheme of publicity to instruct the people in the principles of sanitation and to induce them to carry out the measures recommended.

The women of the county organized a club for the advancement of sanitation. This club was known as the "Community Club." It was county wide in scope. Beginning with about a dozen women, meeting together and formulating the plan of organization, this club within a period of a few weeks grew to have a membership of 1,000. Each woman upon being enrolled as a member of this club obligated herself to use her best efforts to have her own home put in good sanitary condition. The officers of the community club traveled over the county, attended public meetings, and succeeded in organizing local branches of the club in practically every neighborhood of the county. Each member was supposed to concentrate her efforts on the sanitation of her own home, and each local branch of the organization was supposed to bend its efforts toward securing sanitary improvements of a public nature.

The Martinsburg branch concentrated its efforts in arousing public sentiment for the installation of a sanitary sewerage system in Martinsburg. They did much also to present in concrete form to the city authorities evidence of public sentiment for improvements along all lines of sanitation needed in Martinsburg.

The business men and property owners of Martinsburg also formed a "Sanitation club." They appointed an executive committee which did much to get carried out in Martinsburg the sanitary measures recommended by the Public Health Service officers.

RESULTS.

Country homes.—To ascertain the results of the educational work in the rural sections of the county, revisits were made to 455 country homes. These homes were located along the principal roads and were selected as fairly representative of all the homes in the county. On the follow-up visits it was found that at 226 of these 455 homes obvious improvement in methods of excreta disposal had been made. Of the 226 homes at which improved methods were in practice, 195 had installed, and apparently were taking proper care of, sanitary privies.

Upon the completion of the survey on November 15, it was known that at about 10 per cent of all the homes in the rural sections of the county sanitary privies were in use. At 75 of the 455 homes resurveyed, marked improvement in water supplies had been effected.

For many of the homes in the county at which improvements in the construction of the privy had not been made, it was found that by changing the location of the privy in respect to the source of the water supply, or by the more frequent cleaning and by the use of disinfectants in the privies, much had been accomplished for the protection of the household against excreta-borne infection.

The people generally had become informed about the contagiousness of typhoid fever, and upon the development in a household of a case even suggesting the possibility of typhoid fever, reasonably good precautionary measures at the bedside would, as a rule, be promptly instituted.

Schools.—On the original survey of the rural schools not one was found to be provided with either sanitary water closets or sanitary privies. In four of the six school districts of the county money was appropriated for the construction and operation of sanitary privies. A sanitary inspector appointed by the county court devoted most of his time for a period of about three months to work for the improvement of school sanitation.

On the last round of the survey of the schools in the rural sections nearly all were found to be in fairly satisfactory condition in respect to the disposal of human excreta.

Churches.—At the churches, generally, in the rural districts little was accomplished in the way of definite sanitary improvements, but one of the most remarkable results of the survey was accomplished at a large camp meeting held as a religious revival in the southern end of the county. When this camp meeting was held, in 1913, the sanitary conditions on the grounds were bad, and as a result it appeared that typhoid fever had been disseminated through the neighborhood. At least 29 cases appeared from the evidence obtained to be definitely attributable to the insanitary conditions obtaining on the camp-meeting grounds in the late summer of 1913.

The clergymen were apprehensive about holding the meeting in 1914 and had about decided not to hold it, when assured by the officers in charge of the sanitary survey that feasible sanitary measures would free the occasion from any likelihood of danger from a health standpoint.

The sanitary measures carried out on the camp-meeting grounds were the installation of sanitary privies, of fly-proof construction, provided with water-tight receptacles; the screening of kitchen and mess tents, the use of covered garbage barrels for the immediate collection of scraps of food and refuse thrown about the grounds, and the treatment of the water supply with hypochlorite of lime. The sanitary privies were kept clean by daily scavenger service. The privy contents were hauled to a safe distance from the camp and buried in a sanitary manner. The water used for drinking purposes at the camp was hauled from a distance in barrels. The barrels were provided with spigots from which the water was drawn, and around each barrel was a jacket of ice and straw to keep the water pleasantly cool.

The demonstration of sanitation on the camp meeting grounds, according to reports, had a far-reaching effect. Some persons coming from other States to attend the meeting saw for the first time a demonstration of rural sanitation. The meeting continued for 12 days and it is estimated that at least 8,200 people attended it. So far as could be ascertained, not a case of illness reasonably attributable to conditions on the camp-meeting grounds occurred among those who attended the meeting in 1914.

Railway stations.—At 3 of the 12 railway stations in the rural sections, high-grade sanitary privies were installed in the place of open grossly insanitary privies. Similar improvements at the remainder of the stations were promised by the railway officials, but upon the termination of the survey in November had not been effected.

Water-cress beds.—Of the 6 large cress beds in the county from which cress was marketed extensively through the channels of interstate commerce, one was already reasonably well protected from contamination from human excreta when the survey was begun; 2 were afterwards protected by the installation and operation of sanitary privies in place of all of the insanitary privies within 200 yards of the beds; one was protected to a slight degree by the sanitation of a small proportion of the open privies on its immediate watershed; one which had been exposed to extensive pollution with human excreta was not improved by sanitary measures; and one was abandoned by the lessee because the lessor was unwilling to have sanitary measures carried out for the prevention of the pollution of this bed with excreta from a large number of open privies on its watershed. Upon the termination of the survey one of the large beds still in operation had on its quick-spilling watershed within 100 yards of the bed 7 open privies, and farther upstream, but within 500 yards of the bed, were 2 open privies at private homes and 1 at a public school. Another one of the beds still in operation had on its quick-spilling watershed within 150 yards of the bed 8 open insanitary privies, of which 6 were at private dwellings, 1 at a church, and 1 at a railway station. The control of sanitary conditions within the immediate vicinity of the cress beds in Berkeley County appears to be important from a standpoint of the prevention of the interstate spread of disease.

Limestone quarries.—Of the five large limestone quarries, three were radically improved, the improvements consisting the installation of sanitary privy systems, the protection of the water supplies, better screening of dwellings, and increased general cleanliness. At one quarry only slight sanitary improvements were made and at another none.

County health organization.—The county health force was increased by the appointment of a whole-time sanitary inspector and a whole-time clerk. The room in the court house used as headquarters by the Public Health Service officers was continued as the county health office. In this office records of cases of infectious disease were kept, models of sanitary devices were continually on exhibition, and literature was made available for distribution to the public. A full-time health nurse, whose salary was paid by the community club, devoted her time to work in both the rural districts of the county and in Martinsburg.

Martinsburg.—One of the first important results of the sanitary work in Berkeley County was the installation of a hypochlorite plant for the treatment of the public water supply of Martinsburg. A temporary plant was installed early in April, within two weeks from the beginning of the survey. Several months later the temporary plant was replaced by a permanent plant with good tanks made of cement. Previous to treatment this water supply showed on bacteriological examination colon-bacilli always in 10 cubic centimeters and usually in 1 cubic centimeter. After treatment, colon-bacilli were consistently absent as demonstrated by frequent examinations of samples in quantities of 50 cubic centimeters. Although the several public springs located within the city were not abolished, as was recommended, the vast majority

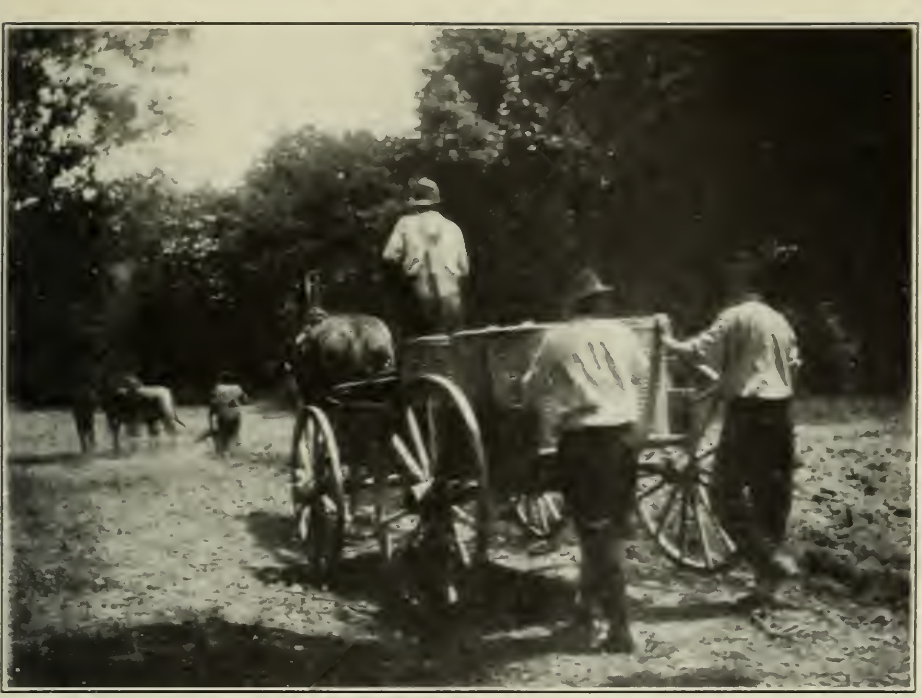


Fig. 14.—Hauling privy contents to disposal field. Berkeley County, W. Va.

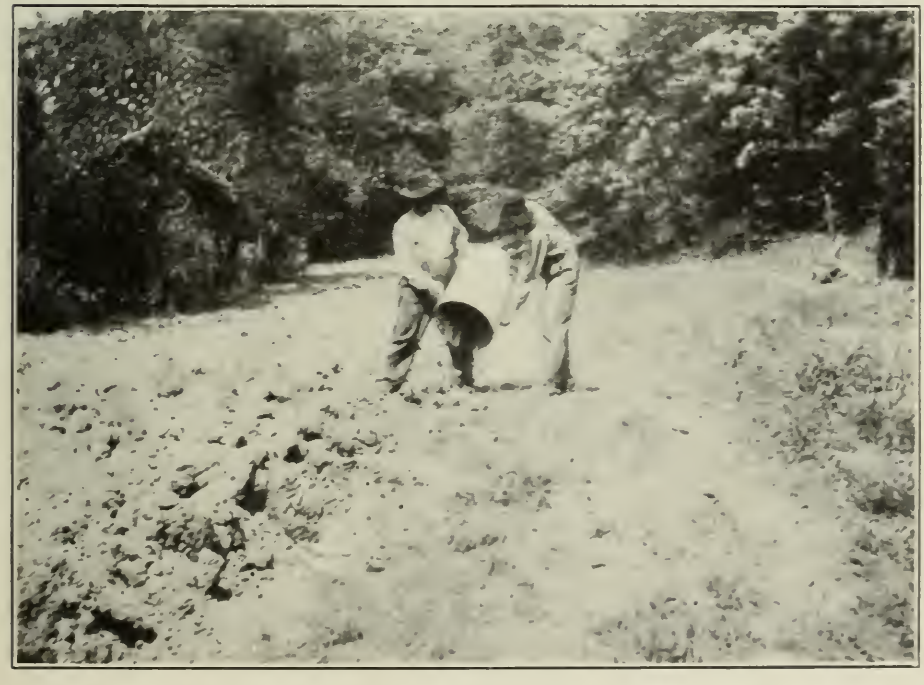


Fig. 15.—Emptying privy contents in plowed furrow. Berkeley County, W. Va.

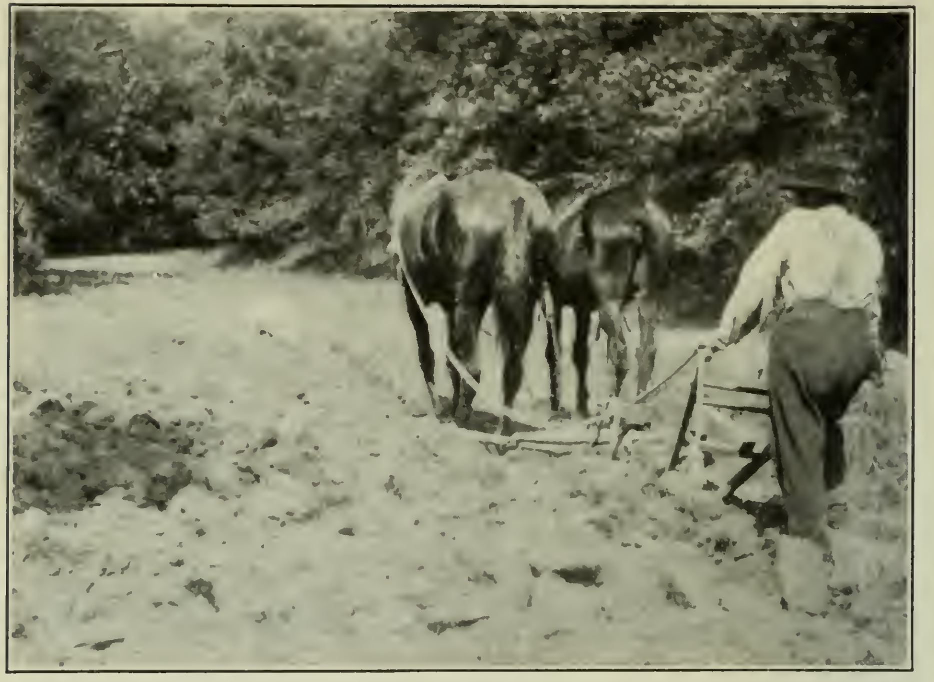


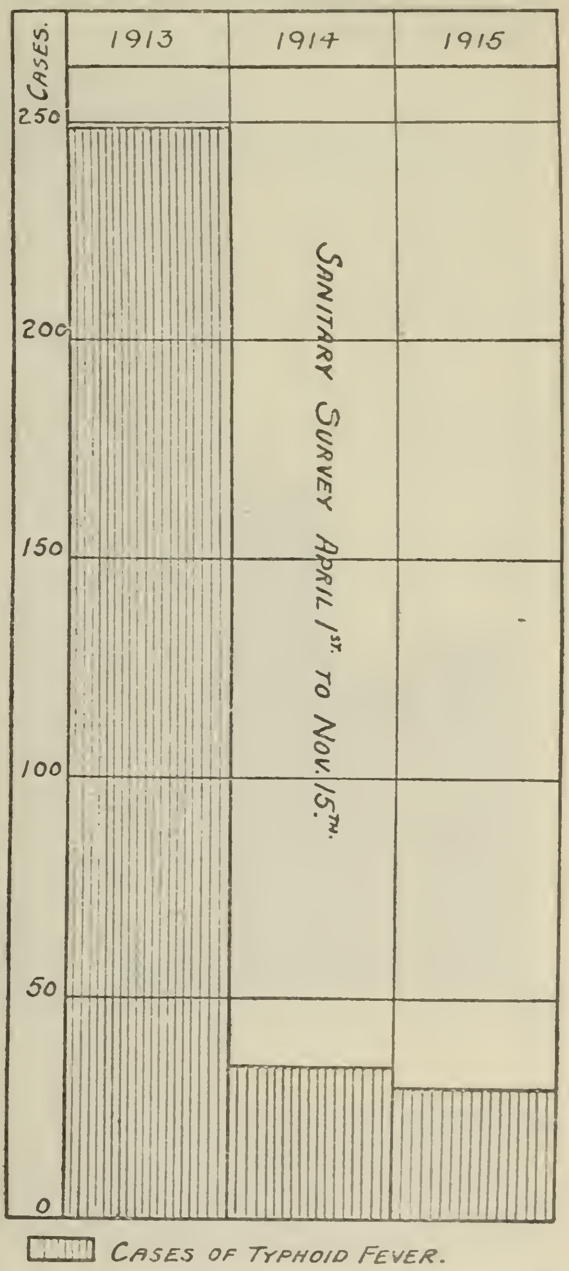
Fig. 16.—Plowing sod over disinfected privy contents. Berkeley County, W. Va.

Fig. 17.—Covering spots left uncovered by the plow. Berkeley County, W. Va.

of the citizens who had been using water from these sources abandoned them when assurances were given that the public (piped) water supply was safe for use. The principal public supply of the city was further protected by the carrying out of sanitary measures on the watershed of its spring source. An open privy and a stable on a steep grade immediately over the spring were removed. The city authorities furnished a sanitary privy to two families living in a house near the spring. The systematic cleaning of this privy was attended to by the city scavenger.

In May a cleansing of the many insanitary privies and cesspools in the city was undertaken (figs. 14, 15, 16, and 17). The city authorities appropriated $1,620 to carry out this work and appointed a full-time sanitary inspector to assist in its direction. About 2,100 privies were cleaned and treated with disinfectant solution. The privy contents after disinfection were hauled away in covered cans and buried outside the city in a sanitary manner. About 400 of the privies were converted into sanitary type by being provided with water-tight receptacles protected against invasion by flies, and in addition to these about 500 were provided with water-tight receptacles, but not made fly proof. In the course of the clean-up over 20,000 bushels of human excretia were removed from the city. Besides the cleaning of the privies, about 500 cesspools in the city were treated with a liberal quantity of the stock disinfectant used in the clean-up work, namely, chloride of lime solution with a strength of 1 pound of chloride of lime to 5 gallons of water. The clean-up work was conducted in the daytime and without offense to the citizens. The disinfectant solution used removed the odor from the privy contents, and the wagons, loaded with the covered cans containing the disinfected matter, passed along the principal streets. A permanent scavenger service for continuing systematic cleaning of the privies was established by the city authorities. The carrying out of the clean-up work in Martinsburg was made possible largely through the efforts of the women's community club and of the business men's sanitation club. The sanitary privies installed in the city were mainly at homes of members of the community club.

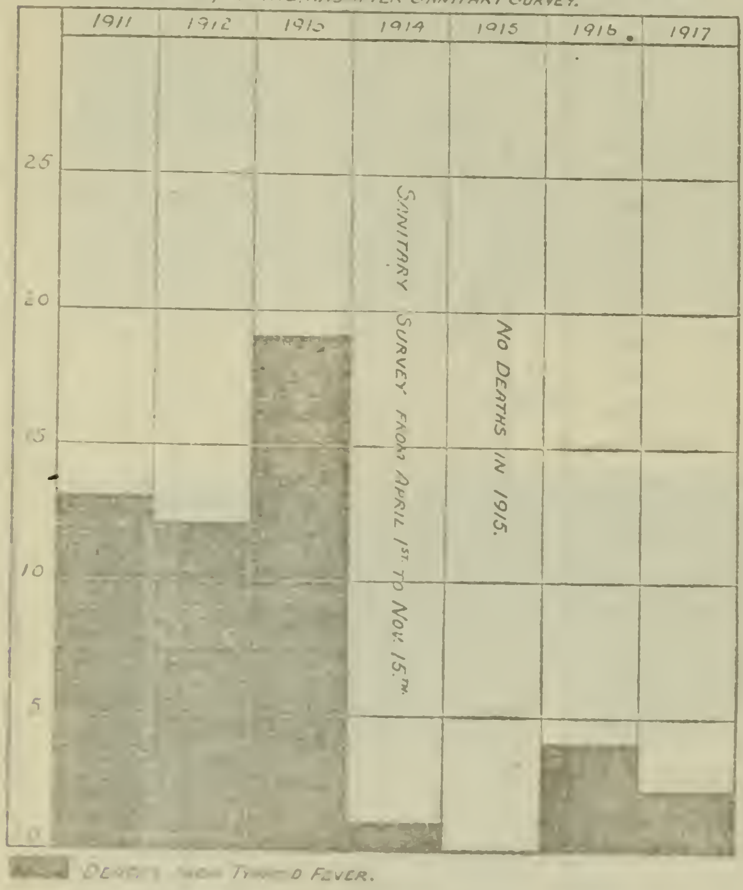
CHART 3:-TYPHOID FEVER CASES REPORTED IN BERKELEY COUNTY, W. VA. IN PERIOD APRIL 1ST TO NOV. 15TH BEFORE, DURING, AND AFTER SANITARY SURVEY BY U.S. PUBLIC HEALTH SERVICE.



An ordinance was passed by the city council requiring prompt report of cases of infectious disease. To facilitate the enforcement of this ordinance, the policemen of the city are required to call at least once every day at the offices of the practicing physicians to collect report cards on cases of infectious disease.

Ordinances were passed by the city council directed toward official control from a sanitary standpoint of milk and other food supplies. Under one of these ordinances dairymen are required to obtain permits from the city health officer in order to sell milk within the city. Requirements for sanitary conditions and methods in handling the milk at the dairy farms and dairies were specified in the ordinances. All dairy farms were inspected, and in compliance with the city's ordinances marked improvements in sanitary conditions and in methods of handling the milk were effected.

CHART 4:– DEATHS FROM TYPHOID FEVER IN BERKELEY COUNTY, W. VA. BEFORE, DURING, AND AFTER SANITARY SURVEY.



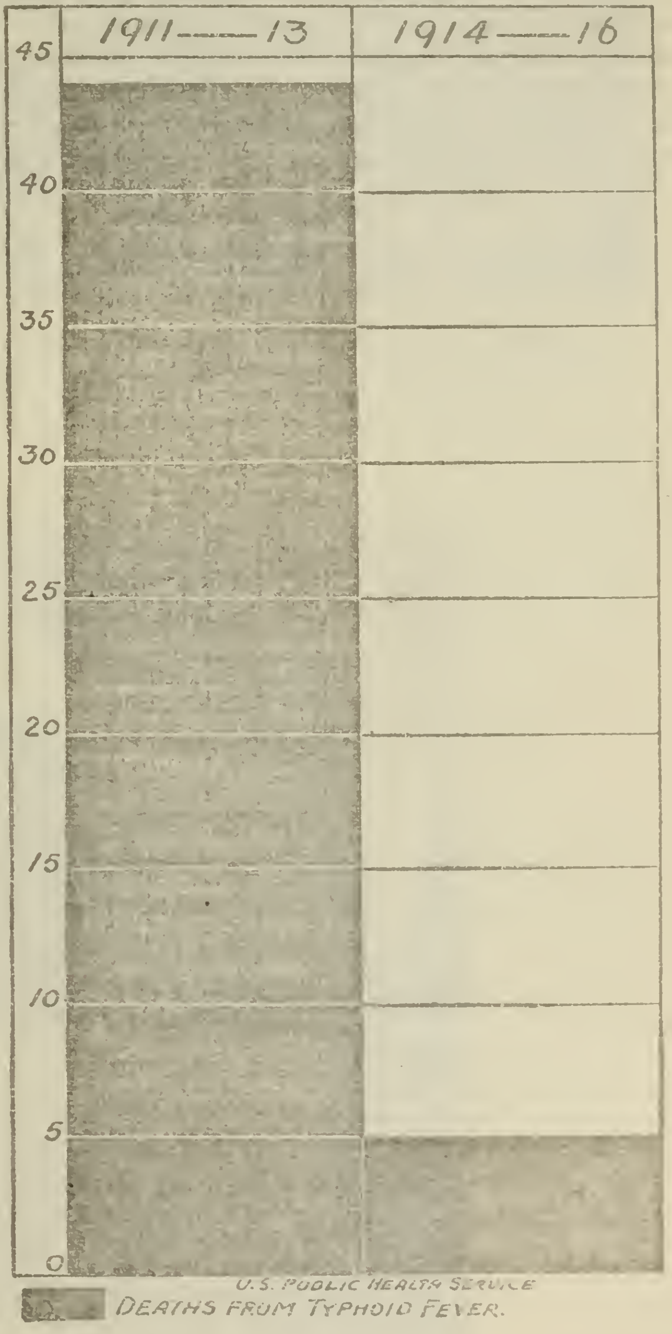
A remarkable sentiment was developed in the city for the installation of a complete water-carriage sewerage system, but, due to legal difficulties in connection with the bonding limit of the city, the holding of an election for voting on a bond issue for the installation of a sewerage system was decided by the legal authorities of the city to be impracticable. If such an election could have been held at any time within 12 months subsequent to the sanitary survey in Martinsburg, it may be conservatively estimated that over 90 per cent of the voters of the city would have voted for the installation of a sewerage system.

The health organization of the city was markedly improved. The city health officer was provided with an office in the city hall. A clerk was furnished him to keep health records. A whole-time sanitary inspector for the city was appointed. The health nurse, supported by the community club, devoted the greater part of her time to work within the city of Martinsburg.

Typhoid fever reduction.—As a result of the sanitary improvements in both Martinsburg and in the rural sections of the county, a remarkable reduction in typhoid-fever prevalence occurred. In the period from April 1 to November 15, 1913, the year immediately before the sanitary survey, at least 249 cases of and 17 deaths from typhoid fever occurred in the county. In the same period, 1914, when the sanitary survey was being conducted, there occurred the county, according to reports which appeared to be complete, only 35 ses of and one death from typhoid fever. The aggregate number of deaths om typhoid fever recorded in the county in the three years (before the surey), 1911, 1912, and 1913, was 44. For the three years, 1914, 1915, and 1916, e aggregate number of aths from typhoid fever corded in the county was ly 5. The reduction in phoid fever in Berkeley ounty appears to furnish important demonstration the feasibility of effectg, by the conduct of intenve sanitary campaigns in ral districts, a wholesome duction in the prevalence diseases which result om filth-borne infections. Charts 3, 4, and 5.)

CHART 5

DEATHS FROM TYPHOID FEVER IN BERKELEY COUNTY, W. VIRGINIA, IN THE 3 YEARS BEFORE AND IN THE 3 YEARS AFTER SANITARY SURVEY BY U.S. PUBLIC HEALTH SERVICE.



RESURVEY.

In the latter part of 1916 n officer of the Public ealth Service was detailed visit Berkeley County ith a view of determining e progress of sanitary ork in the county subseuent to the survey of 1914. this resurvey it was ound that considerable rogress in sanitation had een made in the rural secions of the county, but that here had been some retroression of the work in the ity of Martinsburg. At five f the six rock quarry (inustrial) settlements in the ounty in 1917 high-grade nprovements in the most ssential sanitary conditions ad been completed or were eing carried forward rapdly to completion.

In the county, outside Martinsburg, with a population of about 12,000, only 0 cases of typhoid fever were reported in the period January 1 to December , 1917. The county health officer is convinced that all cases which developed n this period were reported.

The failure of the officials of Martinsburg as yet to take the necessary steps o have installed in that city either a sanitary sewerage system or a complete sanitary privy system is unfortunate and, in view of the strong public sentiment which existed for such sanitary improvement, remarkable. The insanitary conditions obtaining in the city have retarded sanitary progress in the surrounding rural districts. Residents of the country in the vicinity of Martinsburg realize that sanitation of their own homes and neighborhoods can give them but partial protection against filth-borne infection so long as, through business or social intercourse with or through proximity of residence to the city, they are exposed to danger from the hundreds of insanitary collections of human excreta in Martinsburg. The business interests of the city have suffered because of the insanitary conditions. It is hoped that the city of Martinsburg, before being visited by a severe epidemic of typhoid fever or of some other disease caused by filth-borne infection, will clean up as it did in 1914, and next time, after getting clean, provide a complete sewerage system or a complete sanitary privy system so as to stay clean.

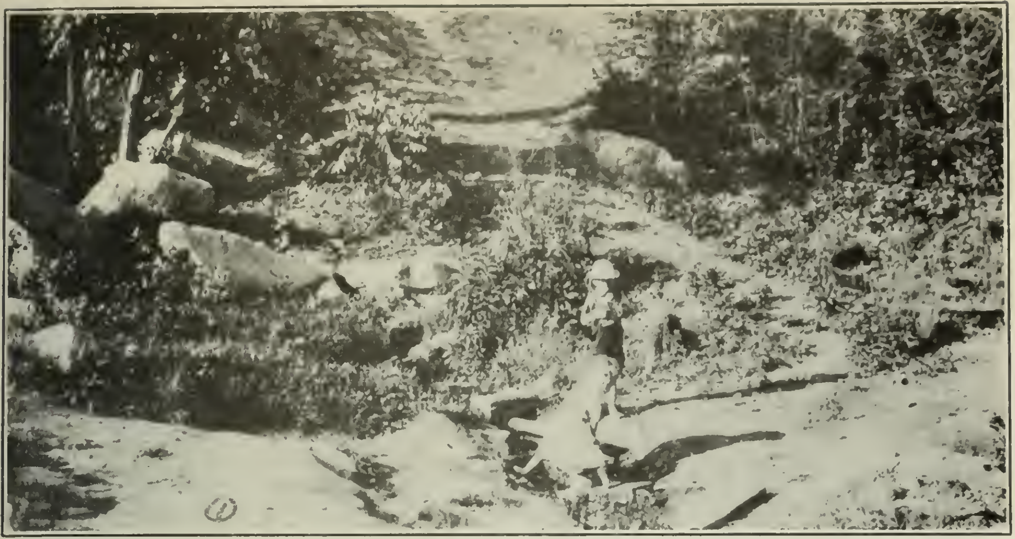


Fig. 18.—Spring constituting outlet of underground stream polluted with drainage from insanitary privies, stables, and pigsties. Drainage entered "sink hole" in limestone stratum 600 feet from spring. Uranine placed in privy contents near sink hole appeared in the water of the spring within two hours. Lawrence County, Ind.

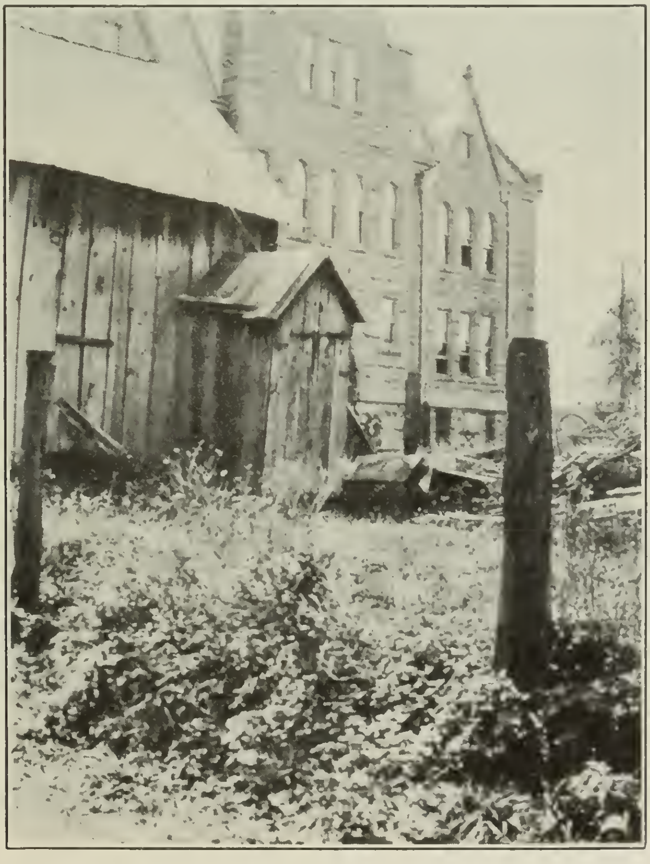


Fig. 19.—View of handsome high school building at Bedford, Ind. Insanitary privy within 20 feet of rear of the building.

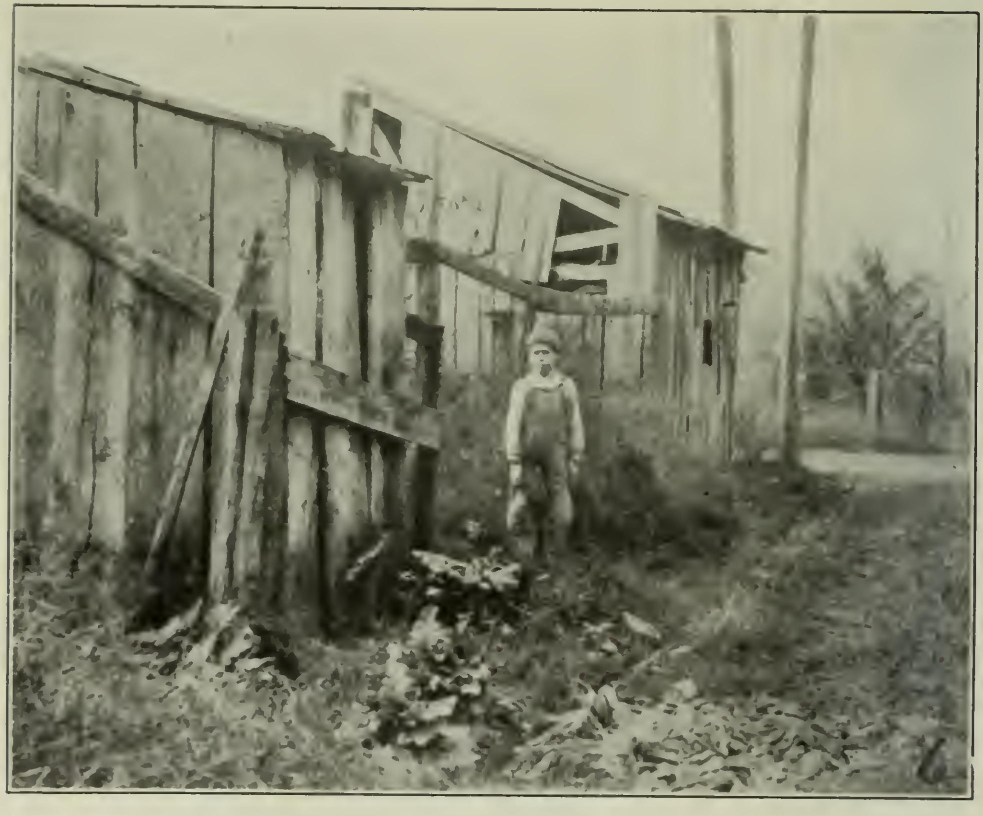


Fig. 20.—Insanitary alley in one of towns in Lawrence County, Ind.

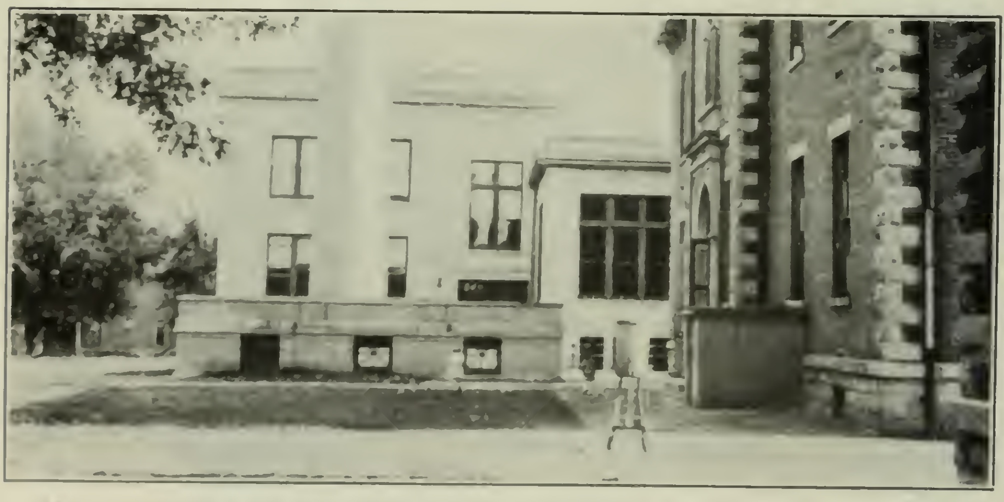


Fig. 21 —Front yard of school, Bedford, Ind. Container of water with common drinking cups attached for use of school children while at play is shown.

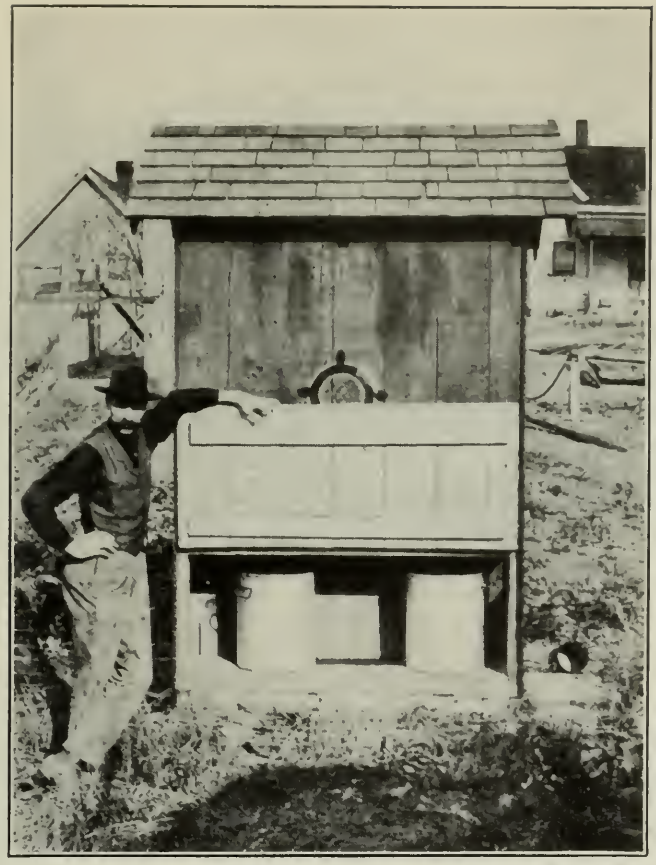


Fig. 22.—One of the first good results of the work of the Community Club of Bedford, Ind. A leading citizen and husband of a member of the club builds a sanitary privy at his home.

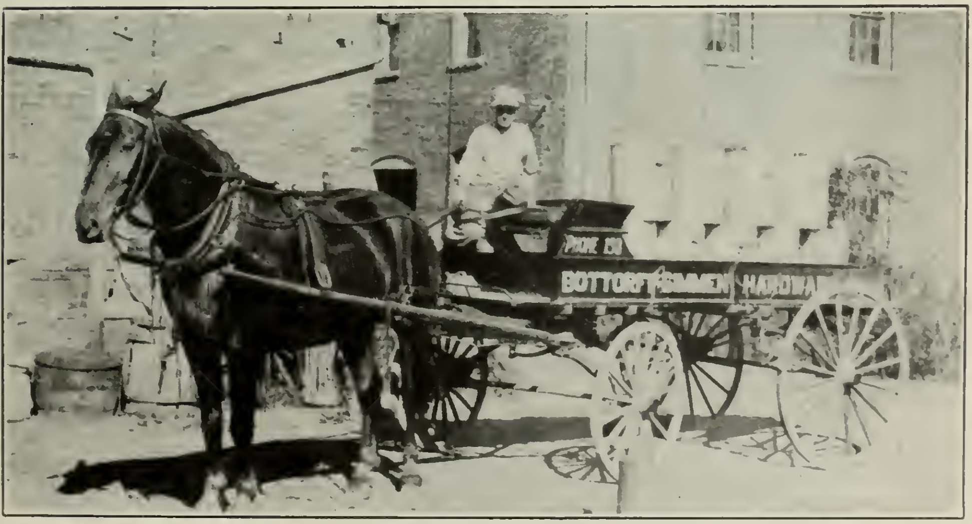


Fig. 23.—Delivering cans for installation in sanitary privies under construction in Mitchell, Ind.

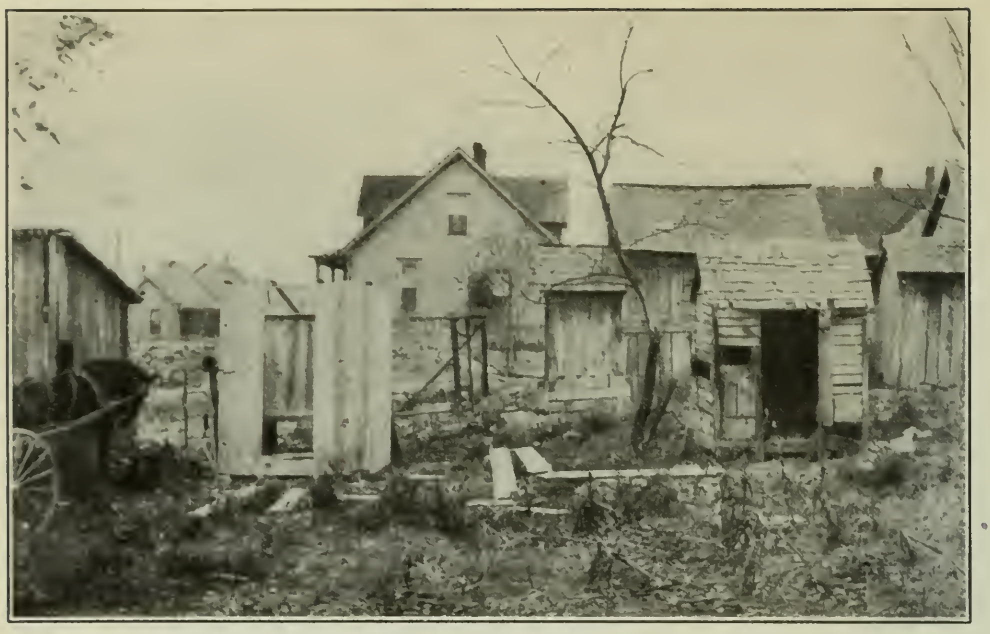


Fig. 24.—The old and the new type of privy in Bedford. The privy under construction was being made of sanitary type and was to take the place of the old insanitary privy.

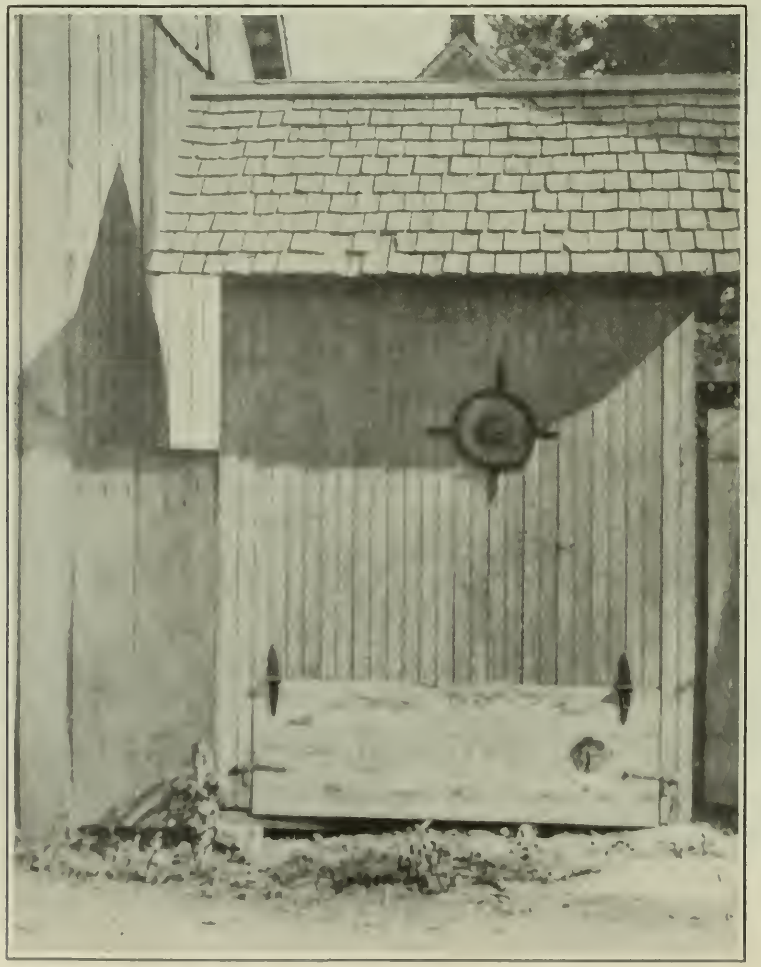


Fig. 25.—Typical sanitary privy installed in Mitchell, Ind., showing the ("sign of the times") official stamp.

SANITARY SURVEY OF LAWRENCE COUNTY, IND.

Lawrence County, Ind., the second of the counties in the United States selected in 1914 by the U. S. Public Health Service for special work in rural sanitation, is located near the center of the southern half of the State of Indiana.

A special reason for the selection of Lawrence County for the survey was that the annual typhoid fever rate for this county had been consistently much higher than that for the State as a whole.

A request for the survey was received from the State board of health and from the county board of health.

The survey was begun on May 7 and was terminated on November 15, 1914.

GENERAL CONDITIONS.

Lawrence County lies between the thirty-eighth and thirty-ninth parallels of latitude and between the eighty-sixth and eighty-seventh meridians of longitude. It is on the drainage shed of the Ohio River. The drainage from the county is carried by the East Fork of the White River into the White River, thence into the Wabash River, and thence into the Ohio River. The county a land area of 456 square miles.

The land of the county generally is hilly or rolling. There is some flat land along the basin of the East Fork of the White River, which river flows across the southern half of the county from east to west. Bedford, the county seat, is located on one of the highest points of the county with an elevation of 700 feet above sea level and about 200 feet above the level of the East Fork of the White River.

Practically the whole county has an underlying bed of limestone which outcrops to the surface at many places in all sections of the county. The limestone stratum is honeycombed with caves and subterranean passages into which surface drainage enters through surface depressions which are known colloquially as "sink holes" (fig. 18). These sink holes are numerous. In most sections of the county there are one or more in every acre of land.

Numerous springs exist in all sections of the county and are largely depended upon as sources of water supply for drinking and culinary purposes. These springs are fed from underground streams flowing through seams in the limestone stratum. In several instances it was demonstrated that these springs received through sink holes in their vicinity surface drainage laden with filth from privies, from pigsties, and from stables. The surface stratum of soil overlying the limestone is for different sections of the country clay loam, or sand, or a mixture of the three. The soil is fertile and for the county as a whole in a good state of cultivation. Corn, wheat, hay, and apples are the principal crops.

According to the census reports, the population of the county in 1910 was 30,625. The population of the county in 1870 was 14,628, and has increased in each decade since then. The urban population is 12,154, and the rural population is 18,471. The urban population is comprised in Bedford (with 8,716 inhabitants) and in Mitchell (with 3,438 inhabitants). The two other incorporated towns in the county are Oolitic and Huron, with populations of 1,079 and 197, respectively. Of the population of the county, 30,279 are white and 345 negro; 813 are foreign born. The rural population per square mile in 40.5. The percentage of males of voting age, who, according to the census report for 1910 are illiterate, is 6.6.

The county is traversed by the Baltimore & Ohio, the Southern Indiana, and the Chicago, Indianapolis & Louisville Railways. Bedford and Mitchell are the principal railway centers. Most of the public roads of the county are in a reasonably good state of improvement.

The principal industries of the county are farming, stock raising, quarrying, orcharding, and dairying. A considerable proportion of the apples and of the dairy products produced in the county is shipped to points outside the State of Indiana.

PLAN AND SCOPE OF SANITARY SURVEY.

The work was done in cooperation with the State and county health authorities. The work comprised (1) a canvass and a sanitary survey of all the rural homes in the county; (2) a sanitary survey of the two incorporated towns (Bedford and Mitchell) with populations over 2,500; (3) a sanitary survey of all schoolhouses, churches, railway stations, post offices, and stores in the rural districts; (4) public addresses on the subject of sanitation with lantern-slide illustrations in all sections of the county; (5) distribution of literature on different phases of the subject of sanitation; (6) the founding of special organizations for the advancement of sanitation; and (7) the epidemiological investigation of cases of typhoid fever as they developed. Thus the work was both investigative and educative. Throughout its course effort was made to interest the people individually and collectively in sanitary matters, so as to cause them to realize and understand the relation existing between insanitary conditions and the causation of disease. Particular emphasis was placed upon the possible dangers in human excreta and the importance of carrying out sanitary measures for protection against such dangers.

In the absence of Surg. L. L. Lumsden the work in Lawrence County was under the charge of Passed Asst. Surg. R. M. Grimm. From May 7, when the work was begun, until July 1, when the original canvass and survey of the rural districts was completed, nine Public Health Service officers were engaged in the detailed work. From July 1 to November 15, when the work was terminated, the number of Public Health Service officers engaged was three. Five representatives of the Indiana State Board of Health assisted in carrying out the details of the work for varying lengths of time ranging for each from a few days to several weeks. The State health commissioner and the assistant State health commissioner visited the county from time to time to confer with the Public Health Service officers and rendered valuable assistance in introducing the workers to local conditions and in giving publicity to the work. The State board of health further cooperated in furnishing data on morbidity and mortality from the records of the State health office and in having conducted bacteriological examination of water samples sent from various sources in the county. The typhoid-fever section of the State health exhibit was shown in various sections of the county from June 9 to August 14 and was a valuable addition to the educational measures employed. The county health officer cooperated in the work throughout its course and, though receiving only a small salary for part time service as county health officer, he, often at considerable personal sacrifice, gave very material assistance in the conduct of both the investigative and educative phases of the work.

Endeavor was made in the visits to the homes to ascertain by careful questioning the history of each family in respect to incidence of disease in general and of typhoid fever in particular. The survey of the premises was made usually in company with some member of the household—the head of the family whenever practicable. Attention was directed especially to human-excreta disposal, stable-manure disposal, water supplies, and the protection of foods from invasion by flies. Literature on excreta disposal, water supplies, typhoid fever, and other appropriate subjects was freely distributed.

Public lectures on sanitation were given from time to time in different neighborhoods. These were usually illustrated with stereopticon slides. In the course of the work 35 public lectures were given. The attendance at the lectures averaged about 140. Thus, besides instructions given to the individual citizens at the homes, about 5,000 of the people of the county heard the facts of sanitation explained at the public lectures.

The house-to-house canvass and survey was extended to all homes in the county outside Bedford and Mitchell. In these two towns surveys were made in sufficient detail to ascertain accurately the sanitary conditions in respect to water supplies, food supplies, and the disposal of human excreta, garbage, stable manure, and other refuse.

In this county the first round of visits to the country homes was completed before the work in the towns was undertaken. After making the sanitary surveys of the towns reports of findings and definite recommendations for the correction of insanitary conditions found were made to the respective town councils. Statement of findings was also made in the course of addresses to mass meetings of citizens. In both Bedford and Mitchell special organizations were formed for carrying out the program of sanitation recommended.

Headquarters were established in the courthouse in Bedford. Circular letters were sent to the families throughout the rural districts explaining the plan and object of the work. Upon request, bulletins on sanitary subjects were sent by mail to the citizens. The local newspapers rendered exceedingly valuable service in giving publicity to the work.

The number of rural dwellings covered by the survey was 3,549, and the number of urban dwellings (all in Bedford and Mitchell) surveyed and canvassed in detail was 552. In the rural districts sanitary surveys were made of the 76 schools, 44 churches, 14 railway stations, 10 post offices, and 27 dairies. In the survey of the schools and churches special inquiry and inspection were made in respect to water supplies and methods of excreta disposal. Railway stations and post offices were surveyed with reference to water supplies, excreta disposal, expectoration on the floors, general cleanliness, and ventilation. Dairies were surveyed with reference to sanitary conditions on the premises, including excreta disposal and water supplies, and with reference to the protection of the milk in the process of handling it from contamination by hands, flies, or utensils.

In October and November 480 homes selected as fairly representative of all the rural homes in the county were revisited one or more times to ascertain the degree of sanitary improvements which had been effected by the educational work.

The greater part of the time of the three Public Health Service officers on duty in the county from July 1 to October 1 was taken up in supervising sanitary measures which were being carried out in Bedford and Mitchell.

FINDINGS IN RURAL SECTIONS.

Of the 3,549 dwellings visited in the rural sections 186 were unoccupied, at 42 the families were absent at the time of the visit, at 19 the families were foreigners unable to speak English, and at 2 the families refused to furnish information. For 3,300 of the rural homes full data were obtained.

Popular attitude toward the work.—At only 2 (or 0.056 per cent) of the homes visited did the investigators fail to meet with a cordial reception. The citizens generally seemed anxious to cooperate in the study and to obtain suggestions about needed corrections of insanitary conditions at their homes.

Race.—At 98.9 per cent of the homes the families were white, and at 1.1 per cent the families were negro.

Number in household.—The number of persons in 3,300 homes at which the number in the household was enumerated was 14,640. Thus the average for each home in the rural sections of the county was 4.4.

Number of rooms to house:	Dwellings.
With 1 room	36
With 2 rooms	446
With 3 rooms	945
With 4 rooms	904
With 5 rooms	467
With 6 rooms	320
With 7 rooms	179
With 8 rooms	94
With 9 rooms	42
With 10 rooms	32
With 11 rooms	17
With 12 rooms	13
With over 12 rooms	7
	3, 502
Not stated	47
Total	3, 549

General appearance of residence.—This applies to the apparent upkeep of the home. From this standpoint 1,609 of the homes were recorded as good, 1,154 as fair, 761 as poor, 2 as very poor, and for 23 the appearance of the residence was not recorded.

Construction of house:	
Frame	3, 257
Log	193
Log and frame	26
Brick	37
Stone	4
Stucco	2
Canvas and frame	6
Brick and frame	2
Not recorded	22
Total	3, 549

General cleanliness.—This applies to refuse such as waste paper, rags, ashes, tin cans, and leaves; to garbage and other kitchen refuse; to litter from stables, pigsties, and chicken pens scattered about the yard; and to obvious collections of dirt inside the dwellings. The general cleanliness was recorded as good for 1,495 homes, fair for 1,355, poor for 624, and for 75 homes it was not recorded.

Cellar or basement.—Nine hundred and forty-four had cellars or basements, 2,564 had none, and for 41 the presence or absence of a cellar was not recorded.

Screening in summer.—At 1,059 homes the screening of dining room and kitchen was complete, at 1,472 the screening of dining room and kitchen was incomplete, and served as a means of excluding probably 50 per cent of the flies seeking admission; at 945 of the homes there was no screening of dining room or kitchen, and at 73 the presence or absence of screening was not recorded. Thus the efficiency of screening at the rural homes in the county was less than 50 per cent of the possible maximum for the protection of foods exposed in dining rooms and kitchens against contamination by flies.

Topography.—One thousand seven hundred and five of the home premises were on rolling ground, 781 on hilly ground, 811 on sloping ground, 213 on flat ground, and for 39 the topography was not recorded.

Drainage from near-by premises.—Five hundred and ten of the premises were downhill from and obviously received surface drainage from yards, stables, privies, pigsties, chicken pens, or other sources of pollution on near-by premises. Two thousand eight hundred and forty of the homes were not exposed to drainage from near-by premises, and for 199 the exposure to drainage from near-by premises were not recorded.

Animals on premises.—At 2,010 of the homes cows were kept, at 2,062 horses, at 768 hogs, at 2,871 chickens, at 1,702 dogs, and at 1,879 cats.

Stable manure.—Of all the rural homes in the county at which animals were stabled, at only 31 was provision made to prevent stable manure from serving as a breeding place for flies.

Disposal of human excreta.—Definite data on the type of toilet in use for the collection and disposal of human excreta were obtained for 3,545 households. Of all the rural homes in the county, only nine were provided with sanitary toilets. Each of these nine homes was provided with a sanitary privy equipped with water-tight receptacles, of fly-proof construction, and kept in sanitary condition by systematic cleaning. Of the remaining 3,536 rural homes, 32 were provided with privies equipped with water-tight receptacles but not of fly-proof construction; 137 with "pit" privies, almost all of which were exposed to invasion by flies and most of which seriously endangered water supplies used for drinking purposes; 632 were provided with surface privies which were boarded up at the back and sides so as to exclude larger animals but not flies from their contents; 1,914 were provided with open-in-back surface privies, the contents of which were thoroughly exposed to flies, larger animals, and surface drainage; 5 were provided with flush water-closets discharged into insanitary cesspools; and at 816 (or 23 per cent) there were no toilets of any kind, the members of the household resorting to stables, barns, or near-by woods to void their excretions.

The distance of the privy from the kitchen at the different homes was as follows: For 129 homes, less than 30 feet; for 667, between 30 and 60 feet; for 1,257, between 60 and 120 feet; for 449, between 120 and 210 feet; for 53, between 210 and 300 feet; and for 90, more than 300 feet. At 6 of the homes the toilet was in the house. For 78 of the homes the distance between the privy and kitchen was not recorded.

Of the 2,724 homes at which there were privies, the privies were used, according to the statements obtained, by all the members of the household at 1,570; by some, usually the women and children, at 961; and for 193 households information on this point was not obtained.

At 1,925 of the homes chickens and other domesticated animals had free access to the privy contents and freely scattered the matter about the premises. According to the surface indications, privy contents were carried by domesticated animals, on the feet of persons, by surface washing or by subsoil seepage to the water supply used for drinking purposes at 889 of the homes; to yards in which children played at 1,729 of the homes; to truck patches in which green vegetables, usually eaten uncooked, were cultivated at 1,790 of the homes; and to grounds from which fruits were collected at 1,053 homes.

At 1,451 of the homes at which privies were in use it was stated that the privy contents were removed when necessary and buried. At one of the homes it was stated that the contents of the privy were removed systematically and burned. At the remainder of the 2,724 homes at which privies were in use no systematic efforts for the disposal of the contents of the privies were made, the excreta being disposed of by chickens and other domesticated animals, by drainage, and by subsoil seepage.

Due to the creviced limestone stratum near the surface of the ground in all sections of the county, and the frequent proximity of excretal deposits to sources of water supply the insanitary conditions in respect to the disposal of human excreta constituted in this county an especially serious menace to the health of the people.

Water supply.—Water for drinking and culinary purposes was obtained from wells at 1,770 of the homes, from springs at 917, from cisterns at 794, and from the Bedford City supply at 1. The source of the water supply was not ascertained at 67 of the homes. At 1,903 of the homes the source of water supply was apparently exposed to pollution with human excreta or other refuse matter and was regarded by the investigator as unsafe. In striking contrast to the opinion of the investigator in respect to the safety of the water supplies in use was the opinion of the responsible members of the households canvassed. Definite statements of opinion on the character of the water supply were obtained from the father, or mother, or some other responsible member of the household at 3,373 homes. At 3,237 of these, the water supply in use at the home was regarded by the members of the household as being safe, and at only 136 was the water supply regarded by the users as either unsafe or questionable. At 869 of the homes the source of water supply was downhill from and obviously exposed to surface drainage from insanitary open privies or from stables or from both. At 1,770 of the homes the well or cistern was protected to a reasonable degree by curbing against surface drainage, and at 1,571 the well or cistern was further protected by a tight platform. At 1,882 of the homes, water was removed from the well or cistern by means of a pump, and at the remainder buckets were used for this purpose. Of the 1,770 homes at which wells were in use, 995 had bored wells with presumably watertight casing and the remainder had dug wells unprotected by casing from subsoil seepage. Almost all of the bored wells were provided with pumps and so protected to some extent from contamination from the surface; but on account of the limestone formation and of the sources of potential contamination on their drainage sheds, a considerable proportion of the bored wells furnished water which, from both surface indications and from the results of bacteriological examination, appeared to be contaminated with human excreta.

According to the statements obtained, 15 of the wells were under 10 feet in depth, 190 from 10 to 20 feet, 296 from 20 to 30 feet, 170 from 30 to 40 feet, 71 from 40 to 50 feet, 59 from 50 to 60 feet, 95 from 60 to 70 feet, 104 from 70 to 80 feet, 121 from 80 to 90 feet, 69 from 90 to 100 feet, 414 from 100 to 200 feet, and 29 more than 200 feet. For 137 definite statements about the depths of the wells were not obtainable.

Considering the soil formation, the proximity of insanitary privies and cesspools to the sources of water supply and the lack of protection of the vast majority of the water supplies from contamination through faulty use of buckets or through surface drainage or subsoil seepage, it appears highly robable that water has been an important factor in the transmission of typhoid ever and other filth-borne infection in the rural sections of Lawrence County.

Rural villages and industrial settlements.—In the several residential villages n the rural sections of the county sanitary conditions were found to be about he same as those obtaining at the isolated country homes.

In the several industrial settlements (stone quarries and cement mills) anitary conditions in respect to excreta disposal, water supplies, and screen-ng averaged considerably better than those obtaining at the isolated country omes.

Schools.—Seventy-six rural schools were surveyed. The source of water upply for the schools was as follows: From dug wells for 8, from drilled vells for 36, from cisterns for 3, from springs for 13, and for 16 the source f water supply was not ascertained.

The types of privies at the schools were as follows: Open-in-back surface rivies with extensive pollution of the soil and full exposure of the contents o flies at 66 of the schools; privies with either retaining boards or pits which revented to some extent distribution of the matter over the surface of the round, but in which the contents were thoroughly exposed to flies, at 10.

Churches.—Forty-four churches were surveyed. The source of water supply or 4 was from dug wells, for 2 from drilled wells, for 3 from cisterns, for 5 rom springs, and for 30 not determined. At 2 of the churches open-in-back urface privies were provided, at 7 surface privies with boarding to prevent to ome extent the distribution of excreta over the surface of the soil were pro-ided, and at 35 of the rural churches no toilets of any kind were provided.

Railroad stations.—Fourteen railroad stations were surveyed. At 8 the eneral cleanliness of the premises was good, and at 6 only fair or poor. The ource of water supply was dug wells at 4, drilled wells at 3, and not deter-nined at 7.

The floors of the waiting room at 5 of the stations presented evidence of free xpectoration, and at 9 of the stations no such evidence was presented.

One of the stations was provided with a privy having water-tight receptacles, ut not of fly-proof construction; 2 were provided with water-closets con-ected with a sanitary sewer; 7 were provided with "pit" privies which were ffensive and the contents of which were exposed to flies; 1 was provided with surface privy having retaining boards to prevent to some degree the distri-ution of excreta over the surface; 1 was provided with an open-in-back privy; nd 2 were not provided with toilets of any kind.

Post offices.—Ten post offices were surveyed. The general cleanliness was ood at 6, fair at 3, and poor at 1. There was evidence of expectoration on the loor at 3, none at 5, and not recorded for 2.

Common drinking cups were fund in use at 2 of the post offices. Water sup-lies were obtained from drilled wells for 3, from dug wells for 3, and the ource of water supply was not determined for 4.

At 1 a surface privy with retaining boards was provided, at 5 open-in-back urface privies were provided, and at 4 no toilet was provided.

Dairies.—The source of water supply used in connection with the handling of he milk was from drilled wells for 16, from a dug well for 1, from cisterns for , from springs for 5, and the source of water supply for 2 was not determined.

The milk house was screened at 13 and unscreened at 14.

The disposal of human excreta at the dairy farms generally was grossly aulty and dangerous. Three of the dairies were condemned in the course of he survey by the State health authorities and put out of business. From some f these dairies milk and milk products were shipped to points outside the State f Indiana.

County health administration.—The health organization consisted of a part-time county health officer who received for his services a salary of about $300 a year. The principal duties expected of the health officer were the treatment of the county poor and the quarantine of cases of smallpox. The office was filled by a practicing physician who, through public spiritedness, devoted a great deal of his time to educational work along health lines.

Sanitary rating.—At 3,368 of the rural dwellings a score was estimated and recorded on excreta disposal, water supply, screening, and general cleanliness. The average sanitary rating for these dwellings was 29.2 per cent.

FINDINGS IN BEDFORD AND MITCHELL.

In the survey of the towns attention was directed especially to refuse disposal, water supplies, and food supplies. The work in the towns was begun the first part of July.

Bedford.—Immediately before the beginning of the sanitary survey of Lawrence County a " clean-up " of Bedford had been accomplished under the auspices and directions of the Ladies' Civic League. As a consequence, the streets, alleys, and yards were remarkably free from waste paper, rags, leaves, trash, tin cans, ashes, and garbage. Collections of the more dangerous dirt, human excreta, and stable manure, however, had been neglected. Hundreds of open, unsightly, offensive privies and numerous stable yards in filthy condition made it obvious that the city in the most essential aspects of sanitation was far from clean.

Bedford has about 2,000 dwellings. At the time of the survey the sewered sections comprised about one-half of the city's area. In the sewered sections about 75 per cent of the dwellings were provided with flush water-closets, and connected with the sewer system. At all the dwellings in the unsewered sections and at about 25 per cent of those in the sewered sections either insanitary privies or insanitary cesspools were in use (fig. 19). The estimated number of cesspools was 100 and the total number of privies was about 1,250.

The sewage was carried through a so-called septic tank in which apparently little septic action was accomplished. The putrescible effluent from the tank was discharged into an underground stream which flows through a cavern in the limestone stratum for a distance of about one-half mile and empties into a surface stream which is a branch of the East Fork of the White River. In its course through the underground stream the sewage seemed to undergo a considerable degree of putrification. Most of the cesspools opened into seams in the limestone stratum and their contents were carried away by underground streams which in some instances fed wells or springs used as sources of water for drinking purposes. About 60 per cent of the privies were of " E " type (open in back) and the remainder of them of " D " type (with retaining boards at the back and sides). In some of the privies the contents rested on the surface of the ground and in others in open pits in the ground under the privy seats. None of the privies were of fly-proof construction (fig. 20). The majority permitted invasion of their contents by chickens and other domesticated animals. Many abutted on alleys—the excreta in them overflowing into the alley and being scattered about by wagon wheels and by the feet of persons. From a number of the privies there was demonstrable contamination of wells by surface or subsurface carriage of the excreta. There was no officially supervised scavenger service for cleaning the privies. Most of the privies were very foul. The amount of excreta in or about each of them ranged usually from 1 to 7 cubic feet. The privies and cesspools in Bedford constituted from a standpoint of typhoid fever causation one of the most serious situations in Lawrence County.

The public water supply, owned by the city, was found to be distributed to practically all parts of the city. There was, however, a considerable popular prejudice against the public supply, and many families used water from their wells and cisterns. Even at the public schools, connected with the city supply, water for drinking was furnished from wells in the school yards. At the handsome high school of the city water from a polluted well was placed in small tanks in the school yard for the children to drink while at play. To each tank was fastened with cords a number of public drinking cups for the children's use (fig. 21). About 400 wells were found in use. The majority were uncased dug wells. Almost all of the wells presented evidence of potentially dangerous pollution.

The public water supply was obtained from the East Fork of the White River. This water was treated with a coagulant and allowed to clear in a well-constructed concrete sedimentation basin. The coagulant and the sedimentation removed almost all turbidity. After sedimentation the water was treated with hypochlorite of lime. Due to insufficient quantity and to faulty application, this process was found by bacteriological examination to be inefficient. Most samples of the water in quantities of 10 cubic centimeters showed the presence of colon bacilli.

There was practically no official supervision over milk and other food supplies. At most of the dairy farms grossly insanitary conditions obtained and faulty methods of handling the milk throughout its course from cow to consumer were in use. Due to faulty collection and disposal of stable manure, garbage, and human excreta, flies were very abundant in the summer season, and they had free access to many stores at which confections and other foods were exposed for sale.

Mitchell.—At the time of the survey Mitchell had about 900 dwellings. The town had no public water supply and no sewerage system. Water was obtained from private wells and cisterns. Some of the wells were drilled wells provided with water-tight casing, but most of them were dug wells without casing. Practically all of the wells were found to be contaminated. Six of the homes were found to be provided with flush water-closets connected with small septic tanks on the premises. The effluents from these tanks were discharged into a large storm sewer which emptied into a small open stream flowing through one section of the town.

Nine hundred and thirty-one privies were found. About 10 of them had pits provided with boarding to exclude chickens, but none were fly proof. All of the others were of the "E" (open in back) type. Most of the privies were very foul. There was no officially supervised scavenger service. The cleaning of the privies was unsystematic and very insanitary. On many premises an open privy and an open (dug) well were within 30 feet of each other. At each of the two hotels of the town the privies used by guests and employees were uphill from and within 30 feet of the dug wells used as the sources of water supply for the hotels. The excreta in the privies were scattered about by drainage and subsoil seepage, by wagons, by feet of persons, by flies, by chickens and other animals, so as to pollute dangerously alleys, streets, yards, houses, water supplies, and foods. The collection and disposal of stable manure and garbage was inadequate and faulty. There was no official supervision over milk or other food supplies.

Mitchell, presenting the insanitary conditions usual in sparsely settled country neighborhoods and the crowded conditions of town life, had been, as far back as the records went, one of the principal foci of typhoid fever infection in Lawrence County.

TYPHOID FEVER PREVALENCE.

Of 14,640 residents of the county who were canvassed, 1,226 (or 8.3 per cent) gave a history of having had typhoid fever. Since the history given depended upon the memory of many different individuals unaccustomed to answering questions asked by a stranger, the actual percentage of the residents who had had typhoid fever probably was considerably larger than 8.3. According to the records of the State board of health for the decade immediately before the survey, Lawrence County was one of the two counties in Indiana having the highest typhoid-fever rates. The average annual typhoid-fever death rate per 100,000 of population recorded for the years 1902 to 1911 was 64.3 for Lawrence County as against a rate of 35.1 for the State of Indiana as a whole.

The topography and the soil formation probably operated as important factors, in conjunction with the insanitary conditions obtaining in both the urban and the rural sections, to cause the relatively high rate of prevalence of typhoid fever in Lawrence County.

The distribution of typhoid fever in the county according to place of residence of persons affected for the four years 1910–1913 is given in the following table, compiled from figures recorded at the office of the county health officer:

	1910	1911	1912	1913	Total.
Bedford	14	15	7	54	90
Mitchell	14	9	15	23	61
Oolitic	19	3	2	1	25
Rural sections	30	31	15	30	106
Total	77	58	39	108	282

The three towns comprising about 43 per cent of the population furnished 62.4 per cent of the cases reported. Thus the typhoid-fever rate of prevalence seems to have been considerably higher for the three principal towns, Bedford, Mitchell, and Oolitic, than for the strictly rural sections of the county.

According to histories obtained in regard to bedside precautions for 92 cases of typhoid fever occurring in the county in the period January 1, 1913, to May 1, 1914, good or fairly good precautions in the disposal of excreta from patients were carried out at the homes of only 37 of the 92 patients.

SANITARY MEASURES RECOMMENDED.

The measures especially recommended for the rural homes were (1) sanitary disposal of human excreta; (2) protection of water supplies from potentially dangerous contamination; (3) protection of foods from invasion by flies; and (4) the prompt institution of rigid cleanliness at the bedside of cases recognized as or suspected to be typhoid fever or other infectious disease.

In Bedford the measures recommended were (1) an increase in and a regulation of the dosage of the public water supply with hypochlorite of lime and the abandonment of polluted wells and springs as sources of water supply; (2) the sanitation of all privies and the establishment of an adequate officially supervised scavenger service to keep the privies in sanitary condition; (3) the enforcement of an ordinance requiring all dwellings within the sewered area to be connected with the sewer and the abolishment of insanitary privies; (4) extension of the sewerage system as rapidly as practicable; (5) radical improvement in the system of collecting and disposing of garbage, stable manure, and other refuse; and (6) official supervision over the milk and other food supplies. The measures especially stressed were those pertaining to excreta disposal and to water supply.

In Mitchell early installation of a public water supply and a sewerage system did not appear practicable, and the main sanitary measure urged was the installation of a sanitary privy system.

COOPERATION.

Active and helpful cooperation in the work was received from the State and county health officials, the practicing physicians, the clergymen, the newspapers, and from several business and civic organizations. In Mitchell the town authorities indorsed the recommendations for sanitary improvement of the town and throughout the period of the survey strongly supported the work.

In Bedford the city authorities appeared exceedingly conservative about supporting the sanitary measures recommended. When the recommendations were first submitted to them they stated frankly that they did not think the local popular sentiment was (and probably never would be) sufficiently favorable to enable them to carry out the principal measure proposed, viz, the installation and operation of a sanitary privy system. About two months later, however, when a strong popular sentiment for sanitation had been developed and after the feasibility of the work had been demonstrated in Mitchell, the mayor and city council of Bedford gave their active support to the program of sanitation recommended for their city.

Soon after the survey of Mitchell had been made the ladies of the town organized a community club, and some weeks later the ladies of Bedford did likewise. The scope of the Mitchell branch was that part of the county which lies south of the East Fork of the White River, and the scope of the Bedford branch was the northern half of the county.

The community club had as its sole purpose the advancement of specific sanitary measures. Both the Mitchell and the Bedford branch of the organization did much to develop and to crystallize into action popular sentiment for sanitation. The Mitchell branch soon after its organization had a membership of over 500, and the Bedford branch by November 1 had a membership of over 1,000. Due largely to the efforts of the community club the city council of Bedford was persuaded to appropriate $500 for cleaning privies preliminary to converting the open privies into sanitary type. The mayor appointed three members of the council to cooperate with the executive committee of the community club in getting carried out the sanitary measures (fig. 22).

In both Mitchell and Bedford the local business men formed sanitation clubs. The work made good progress in Mitchell from the start, but it did not make good progress in Bedford until a number of prominent local business men appointed as a committee from the men's sanitation club accompanied the investigators on a round of inspection of the city and saw for themselves the difference between rows of insanitary privies and rows of sanitary privies.

In a chautauqua held at Mitchell in the course of the work one of the most distinguished lecturers on the program, appreciating the local interest in the subject, made sanitation the theme of his lecture.

Excellent support was given to the work by a company operating several stone quarries and cement mills in the county. This company had the sanitary measures carried out on its properties and encouraged its employees living away from the company's settlements to carry out the measures in their homes.

RESULTS.

Country homes.—Groups of representative country homes in different neighborhoods were revisited to ascertain the degree of sanitary improvement accomplished subsequent to the first visit or survey. The aggregate number of homes in these groups was 480. At 130 (or 27.09 per cent) marked improvement in methods of excreta disposal, including use of better types of privies, had been effected. At 42 (or 9 per cent) of the 480 homes high-grade sanitary privies with water-tight receptacles and of fly-proof construction had been installed in the place of grossly insanitary open privies.

Besides the improvement in methods of excreta disposal considerable progress had been made in the protection of water supplies and in general cleanliness of premises. Since cool weather had set in before the follow-up survey was begun, improvement in screening of homes could not be determined. From the observations made on the follow-up round of inspection, the sanitary score of the average country home in the county had been raised about 16 per cent.

From 2 to 4 weeks after the first follow-up visit 112 of the 480 homes were revisited a second time. These homes included none at which a sanitary privy was found on the first follow-up visit. Between the time of the first and that of the second revisit sanitary privies had been installed in the place of insanitary privies at 10 (or 8.9 per cent) of the 112 homes. The findings on the second follow-up visit suggest what might be accomplished from highly intensive work, including repeated visits to homes in strictly rural sections.

Industrial settlements.—In the several stone and cement mills in the county all privies of insanitary type were converted into privies of high-grade (L. R. S.) sanitary type.

Railway stations.—At 2 of the 14 railway stations good examples were set by the installation of sanitary privies in place of grossly insanitary privies.

Schools.—Little progress was made in actual work, although the school authorities agreed that the improvements recommended were needed.

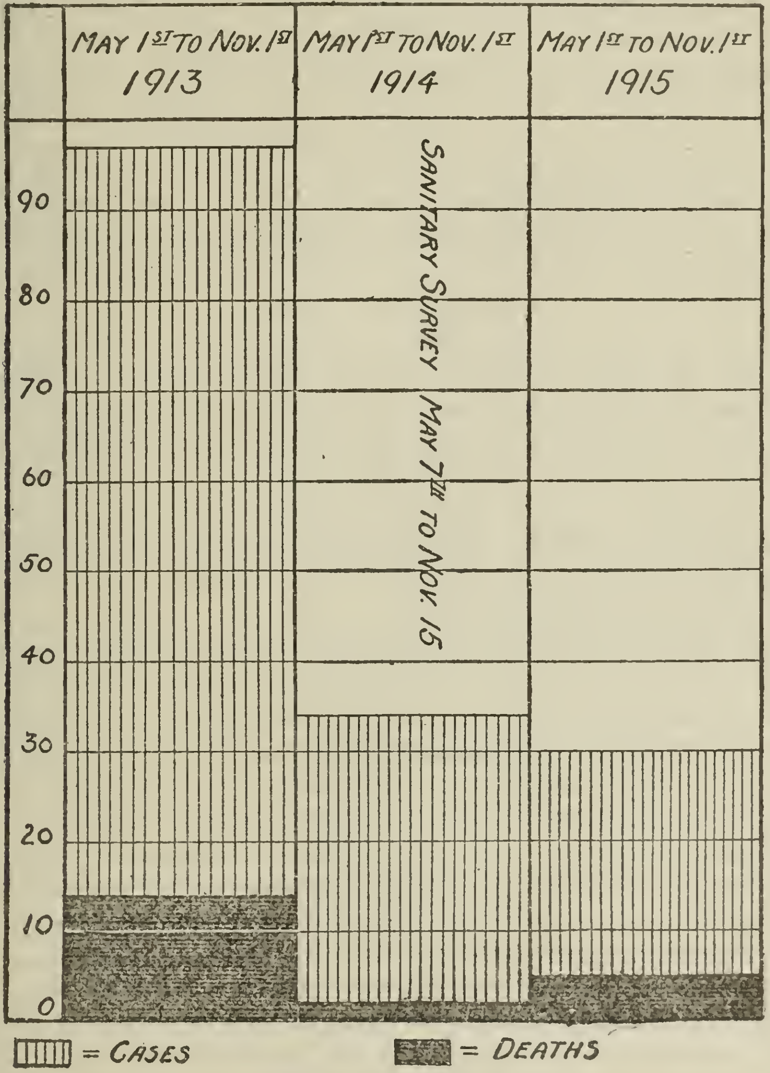
Bedford.—An improved apparatus for the treatment of the public water supply with hypochlorite of lime was installed and the dosage of the water with the chemical increased. Subsequent to this improvement in the treatment, the water was found on repeated bacteriological examinations to be free from colon bacilli. With assurances received about the safety of the public supply many families abandoned their polluted wells and springs as sources of water for drinking and culinary purposes.

In cooperation with the Community Club, the mayor and city council took active steps to have all the insanitary privies abolished and replaced with either sanitary privies or with sanitary water-closets. At the time the survey was terminated 106 insanitary privies had been converted into sanitary type and an additional considerable number had been replaced with water-closets connected with the sewer (figs. 23 and 24).

This work was continued and within 2 months following about 500 more insanitary privies were converted into privies of sanitary (A) type. A scavenger service to clean the privies was established and a sanitary inspector appointed to supervise the work.

Mitchell.—At the time the survey was terminated 560 (or 60 per cent) of the 931 insanitary privies in the town had been converted into sanitary (A) type (fig. 25). An adequate scavenger service was established to clean the privies at least once every two weeks. The privy contents were hauled out of town to a suitable field and buried in a cleanly manner in plowed furrows. An ordinance requiring all privies in the town to be made of sanitary type became effective soon after the termination of the survey, and within 3 months thereafter only 15 of all the privies in the town remained of insanitary type. The sanitation of the privies gave a high degree of protection to the water supplies against dangerous contamination. The difference in the appearance and in the atmosphere of the community was striking. The citizens generally became enthusiastic supporters of the cause of sanitation and marked improvements in general cleanliness of premises and in the protection of foods from flies and other agents of contamination were made.

CHART 6 :– TYPHOID FEVER REDUCTION FOLLOWING SANITARY SURVEY IN LAWRENCE COUNTY, INDIANA.



U.S. PUBLIC HEALTH SERVICE

Typhoid fever reduction.—As a result of the sanitary improvements in the towns and in the country neighborhoods a very wholesome reduction in typhoid fever prevalence occurred. For the period July 1 to November 1, 1914, the year of the sanitary survey, the records of the county health officer showed for the county only 2 deaths from typhoid fever as against 13 for the corresponding period of 1913 (chart 6). The number of deaths from typhoid fever recorded for the county in the 2 years before the survey, 1912 and 1913, was 20, and in the 2 years, 1915 and 1916, after the survey, 13. In the calendar year, 1915, the number of deaths from typhoid fever recorded for the county by the county health officer was 5, only a little over a third of the number,

14. recorded for the year 1913. That the reduction in the typhoid fever rate for Lawrence County in 1914 was due to the sanitary work rather than to a difference in climatic or other uncontrollable conditions is indicated by the following table. which gives the record of deaths from typhoid fever in corresponding periods (summer or fall) of different years for Lawrence and adjacent counties:

County.	1909	1910	1911	1912	1913	1914
Orange	8	4	3	2	4	4
Jackson	4	10	2	1	1	5
Monroe	4	4	....	5	4	2
Martin	11	4	5	5	3	2
Green	10	7	3	9	8	4
Total average for each year	7.4	5.8	2.6	4.4	4	3.4
Lawrence	11	6	10	6	13	2

The death rate per 100.000 from typhoid fever in the county in 1915 was 13.1, and in 1916, 21.05, as against an average annual rate of 64.3 for the decade 1902–1911.

RESURVEY IN 1916.

In the spring of 1916 observations were made to note progress or retrogression in sanitation in the county since 1914. It was found that at the country homes some apparent progress had been made. At almost all of these homes at which sanitary privies had been installed in 1914 the privies were still in good condition. At the several hundred homes at the limestone quarries and cement mills all privies were found in excellent condition, and these industrial settlements since the sanitary improvements had been made had been entirely free from typhoid fever.

In Bedford, due to faulty scavenger service and inadequate official supervision, about 50 per cent of the privies made of sanitary type in 1914 had retrogressed. but the abolishment of privies made possible by a radical extension of the city's sewerage system had gone on at a good rate. It was expected that all sections of the city would be sewered by the fall of 1916.

In Mitchell about 75 per cent of the privies made of sanitary type in 1914 were still in good condition. The retrogression in about 25 per cent of the privies appeared to be due to inadequate scavenger service and to a failure of the town authorities to enforce the sanitary ordinance which appeared still to have strong popular sentiment supporting it.

In the fall of 1916 an election was carried for a bond issue for the installation of a public water supply and sewerage system in Mitchell. The work of installing the systems and of having house connections made to them was being done in the summer and fall of 1917. Thus the installation of a sanitary privy system, with the remarkable educational results which followed it, appeared to enhance the steps necessary for securing a sewerage system in this town.

From these observations, and the general attitude toward sanitation still presented by the citizens. it appears that the work in Lawrence County in 1914 was reasonably successful, and that if a reasonably adequate local health organization were established to continue intensive health work among the citizens. this county as a whole would attain and maintain a high standard of sanitation.

SANITARY SURVEY OF UNION COUNTY, MISS.

Union County, the third of the counties in the United States selected in 1914 y the United States Public Health Service for special work in rural sanitation, s located in the northeastern part of the State of Mississippi.

Union County was selected for the work because it appeared to present fairly epresentative sanitary, economic, and social conditions for an extensive section f the State which is designated the "hill section," in contradistinction to the delta section." In the delta section malaria is the big health problem. In he hill section generally the prevalence of malaria is not high, and typhoid ever, hookworm disease, and other diseases resulting from filth-borne infecion occupy a prominent place in the morbidity situation.

Requests for the survey were received from the State board of health, the ounty health organization, the Town Council of New Albany, which is the rincipal town and seat of government of the county, and from local civic rganizations.

The survey was begun June 16, 1914, and ended November 15, 1914.

GENERAL CONDITIONS.

Union County lies between the thirty-fourth and thirty-fifth parallels of latiude and is bisected by the eighty-ninth meridian of longitude. The county is bout 30 miles in diameter from east to west and 15 miles in diameter from orth to south, and has an area of 413 square miles. The county is traversed y the Tallahatchee River from the northeast to southwest and is served by the t. Louis & San Francisco and the New Orleans, Mobile & Chicago Railroads. ocated at the intersection of these two railroads is the county seat and prinipal town—New Albany.

The county generally is hilly or rolling. The soil formation is clay, with an dmixture of sand. The sand constituent varies in quantity in different secions of the county, but forms a relatively small part of the upper stratum of he soil, with a depth ranging from 10 to 30 feet for the average section. A arge proportion of the land area—probably over 60 per cent—is wooded.

The land under cultivation is about average for that section of the State. It resents as a whole a striking example of the overworking of the single-crop dea. The agricultural pursuits are devoted almost exclusively to the raising f cotton. Corn and hay are produced only to a very small extent and chiefly or the purpose of providing fodder for the mules and horses used in the ultivation of the cotton crop. A large proportion of the cotton lands is worked y tenants. They do their business on a credit basis. If the cotton crop ails, or if the price of cotton at picking times happens to be low, severe ecoomic depression for the county inevitably results. The principal mechanical ndustries are cotton ginning and sawmilling.

According to the census reports, the population of the county in 1910 was 8,997. Of this number 14,780 were white and 4,217 colored. The number f persons to the square mile was 46.1. The county is entirely rural. New lbany, the largest town, had a population in 1910 of 2,009. Three other incorporated centers in the county are the villages of Myrtle, Ingomar, and Blue Springs, with populations, respectively, of about 800, 300, and 200. The local government in each of these three incorporated villages was largely theoretical. Therefore, in making the sanitary survey, the homes in these three villages were dealt with as were the strictly country homes.

The government of the county is vested in a board of supervisors, composed of five members, each of whom is elected from one of the five "beats" which constitute the political divisions of the county.

PLAN AND SCOPE OF SANITARY SURVEY.

The work was done in cooperation with the State and county health authorities. The work comprised (1) a canvass and sanitary survey of all the rural homes in the county, including all the homes in the small towns of Myrtle, Blue Springs and Ingomar; (2) a sanitary survey of the town of New Albany; (3) a sanitary survey of all schoolhouses, churches, railway stations, post offices, and stores in the rural districts; (4) public addresses on the subject of sanitation, with lantern-slide illustrations, in all sections of the county; (5) distribution of literature on different phases of the subject of sanitation; (6) the founding of special organizations for the advancement of sanitation; and (7) the epidemiologic investigation of cases of typhoid fever as they developed.

In the absence of Surg. L. L. Lumsden, the work in Union County was under the charge of Asst. Surg. H. C. Yarbrough. Headquarters were established in the courthouse at New Albany, and temporary bases at different points throughout the county, as distance required.

The force engaged in the detailed canvass and survey consisted of five officers furnished by the Public Health Service and one furnished by the State board of health. The director of sanitation of the State board of health from time to time in the course of the survey visited the county to confer with the officer in general charge of the rural sanitation work of the Public Health Service and to address public meetings. He rendered valuable assistance also in introducing the workers to local conditions and in giving publicity to the work. The State board of health further cooperated in making bacteriological examination of samples of water from different sources in the county and of specimens from suspected cases of typhoid fever and from persons suspected to be carriers of typhoid infection. The county health officer, though paid only a small salary for part-time service, devoted a great deal of his time to the work—much more than his salary warranted—and rendered very material assistance.

Public lectures on sanitation were given at the start of the work in different neighborhoods. These were usually illustrated with stereopticon slides. In the course of the work 40 public lectures were given. The attendance at the lectures averaged about 99. Thus, besides instructions given to the individual citizens at the homes, about 4,000 of the people of the county heard directly the facts of sanitation explained at the public lectures.

The house-to-house canvass and survey was extended to all homes in the county. In New Albany survey was made in sufficient detail to ascertain accurately the sanitary conditions in respect to water supplies, food supplies, and the disposal of human excreta, garbage, stable manure, and other refuse.

In the strictly rural districts 3,333 homes were visited, but of this number 338 were vacant or had no one at home, and 2,995 were covered in detail by the canvass and survey. In New Albany 555 homes were surveyed. In the county, outside New Albany, sanitary surveys were made of the 57 schools, 38 churches, 3 railway stations, and 6 post offices.

In the latter part of the working period all of the homes in New Albany and 442 homes in country neighborhoods selected as fairly representative of all the rural homes in the county were revisited one or more times to ascertain the degree of sanitary improvements which had resulted from the educational work.

The studies were facilitated by a remarkable spirit of cooperation manifested by the citizens generally. In the course of the visits to the homes the investigators failed to meet with a reasonably cordial reception in only one instance.

FINDINGS IN RURAL SECTIONS.

Data were recorded for 2,995 of the homes in rural sections of the county.

Race.—At 2,190 of the homes the families were white, at 566 homes they were negro, and for 239 homes the race of the families was not recorded.

Number of rooms to house:	Dwellings.
With 1 room	19
With 2 rooms	662
With 3 rooms	934
With 4 rooms	742
With 5 rooms	333
With 6 rooms	149
With 7 rooms	50
With 8 rooms	26
With 9 rooms	12
With 10 rooms	7
With 11 rooms	1
With 14 rooms	1
Not stated	59
	2, 995

General appearance of residence.—Seven hundred and seventy-two of the homes were recorded as good, 1,434 were recorded as fair, 750 poor, 13 bad, and for 26 this information was not recorded.

Construction of house:	
Frame	2, 615
Log	165
Log and frame	197
Not stated	18
	2, 995

General cleanliness.—This applies to refuse, such as waste-paper, rags, ashes, tin cans, and leaves, to garbage and other kitchen refuse, to litter from stables, pigsties, and chicken pens scattered about the yard, and to obvious collections of dirt inside the dwellings. The general cleanliness was recorded as good for 1,032 of the homes, fair for 1,194, poor for 609, bad for 59, and for 101 homes it was not recorded.

Cellar or basement.—Sixty-seven homes had cellars or basements, 2,854 had none, and for 74 the presence or absence of a basement or cellar was not recorded.

Screening in summer.—At 180 homes the screening of dining room and kitchen was complete, at 471 only partial, at 2,064 (or 76 per cent) there was no screening at all, and for 280 the information was not recorded.

Topography.—One thousand two hundred and seventy-four of the home premises were on hilly ground, 759 on sloping ground, 158 on flat ground, 766 on rolling ground, and for 38 the topography was not recorded.

Drainage from near-by premises.—Fifty-four of the premises were downhill from and obviously received surface drainage from yards, stables, privies, pigsties, chicken pens, or other sources of pollution on near-by premises. Two thousand six hundred and seventy-eight of the homes were not exposed to drainage from near-by premises, and for 263 the exposure to drainage from near-by premises was not recorded.

Animals on premises.—At 2,499 of the homes cows were kept; at 2,338, horses; at 2,555, hogs; at 2,729, chickens; at 2,087, cats; at 1,759, dogs; at 18, no stock; and for 79 data on this point were not recorded.

Stable manure.—At only four of the homes was provision made to prevent stable manure from serving as a breeding place for flies. At 2,911 there was no such provision made, and for 80 no information on this point was recorded.

Disposal of human excreta.—Of all the homes in the county outside of New Albany, only two were provided with water closets. Seven hundred and eighty-two were provided with privies, and 2,211 (or 73.82 per cent) were without any toilets of any kind. Of the 782 privies in use, 756 were open-back surface privies, the contents of which were thoroughly exposed to flies, larger animals, and surface drainage; 20 were surface privies boarded up at the back to exclude larger animals but not flies; only 4 were of the sanitary "A Type," provided with water-tight receptacles and of fly-proof construction; 1 was "B Type" (provided with water-tight receptacle but not of strictly fly-proof construction), and 1 "C Type" (practically of fly-proof construction but not provided with water-tight receptacle).

The distance of the privy from the kitchen door at the different homes was as follows: For 64 homes, from 30 to 60 feet; for 242 homes, between 60 and 120 feet; for 277, between 120 and 210 feet; for 74, between 210 and 300 feet; for 84 homes, 300 feet or more; and for 41 homes the distance was not recorded.

Of the 782 privies in use, only 237 were used by all members of the household; 396 were used by some, usually the women and children, but not all the members of the household; and for 149 households information on this point was not obtained.

At 756 homes chickens and other domestic animals had free access to the privy contents and freely scattered them about the premises. According to the surface indications, privy contents were carried by domestic animals, on the feet of persons, by surface washing or subsoil seepage to the water supply used for drinking purposes at 437 homes; to the yards at 666 homes; to truck patches and fruit ground at 632 homes.

At 208 of the homes where privies were in use it was stated that the contents were removed and buried. At one of the homes it was stated that privy contents were removed and burned. At the remainder of the homes at which privies were in use no systematic efforts for the disposal of privy contents were made, the excreta being disposed of by chickens or other domestic animals, by drainage and seepage. At the 2,211 homes not provided with toilets the persons in the family, including in most instances grown women, had recourse to near-by woods, barns, or stables to void their excretions. The promiscuous deposits were freely exposed to flies, and chickens and other domesticated animals scattered the matter about the premises. It was carried about to a considerable extent on the feet of persons. The places in the woods frequented were found in many instances to be near by and uphill from unprotected springs and wells. Thus a large proportion of the good people in this county were protected against the dangers of contamination with their excretions only by dilution and by the natural agents of purification, sunlight and oxidation.

Water supply.—Water for drinking and culinary purposes was obtained from wells at 2,641 of the homes; from springs at 110 homes; from cisterns at 37; at

1 from city supply; at 176 there was no source of water supply on premises; and at 30 data on this point are not recorded. Of the 2,641 wells in use 1,629 were dug, 1,002 (including 96 artesian wells) were bored, and of 10 the character was not stated. In 2,024 cases buckets were used in drawing water from the wells, in 521 pumps were used, and in 96 the water flowed under its own pressure.

According to statements obtained, one of the wells was less than 10 feet deep; 214 were from 10 to 20 feet; 477 from 20 to 30 feet; 429 from 30 to 40 feet; 198 from 40 to 50 feet; 116 from 50 to 60 feet; 37 from 60 to 70 feet; 67 from 70 to 90 feet; 112 from 90 to 125; 184 from 125 to 200; 423 were 200 feet or more; and the information for 333 as to depth was not recorded.

At 2,379 of the homes the water supply was regarded as safe by the person interviewed; at 102 it was regarded as unsafe, and for 308 the opinion of the person interviewed was not recorded. At only 614 was the water supply regarded as safe by the inspector; at 1,965 (or 76.15 per cent) unsafe, and at 210 inspector's opinion was not recorded.

At 326 of the homes the source of water supply was obviously exposed to gross pollution with human excreta and other refuse matter, such as stable manure, which in many instances contained human excreta. For a considerable proportion of the bored wells having water-tight metal or terra cotta casing extending from above the surface of the ground down through a water-impervious stratum, the water was exposed to contamination through the medium of the bucket and rope used for lifting the water. In many instances the long, narrow bucket and rope attached when not in use lay on ground frequented by chickens which had just come from scratching in exposed collections of stable manure and human excreta.

Schools.—Fifty-seven rural schools were surveyed. The source of water supply for the schools was as follows: From bored wells for 12 schools, from dug wells for 12 schools, from springs for 2 schools; 31 schools had no water supply on the premises, and the source of drinking water for the pupils at these schools was not ascertained. Of the 26 schools with water supply on the grounds the water was considered safe at 4, unsafe at 4, and for 18 schools no opinion as to the quality of the water was recorded. Twenty-five schools had but one room, 13 were 2-room schools, 2 were 3-room schools, and for 17 schools the number of rooms was not recorded.

The general cleanliness of 13 schools was good, of 18 fair, of 8 poor, and for 18 information as to cleanliness was not recorded.

For one of the schools the presence or absence of privies was not recorded. Of the 56 schools for which the information was recorded only 10 were provided with privies of any kind; in 46 schools the pupils of necessity having recourse to the bushes. Of these 10 schools with privies 3 had two privies each and 7 had one privy each. All of the privies were of the lowest type, mere sheds for privacy, permitting the filth to contaminate the soil and find its way to water and food supplies by means of drainage and the feet of flies and barnyard animals.

Post offices.—Six rural post offices were inspected. Two had insanitary privies, four had none at all. Three had dug wells and three had no private water supply. The general cleanliness of five was good, of one only fair.

Railroad stations.—Three were inspected. Two had insanitary privies, one none at all. The two having privies kept them cleaned at more or less regular intervals, and the excreta were buried. None of these railroad stations had a drinking water supply. The general cleanliness for all three stations was good.

Churches.—Thirty-eight were inspected. None of them had privies. Seven had wells, of which four were bored and three dug. The water supply was considered safe for two wells, unsafe for one well, and for four wells the quality of the water was not recorded.

FINDINGS IN NEW ALBANY.

In New Albany there are about 555 dwellings. The ground is hilly. The town is progressive and manifests an excellent community spirit. The interests of the town and those of the county as a whole are harmonized to a remarkable and unusual extent. The merchants of the town cooperate with the farmers of the rural districts in their endeavors to better the drainage system of the county and to improve public highways. The commercial interests of the people are served by an active, well-organized business men's league. The town owns and operates its water works, light plant, and ice plant. The detailed sanitary survey of the town was not made until the first round of survey of the country homes had been about completed. The results in the county as a whole probably would have been better if the sequence of the work had been different and the survey of the town had been made before that of the country homes. The town responded promptly to the recommendations made for sanitary improvements and furnished a demonstration for other sections of the county which would have been more effective if it had been accomplished before the surveys of the country neighborhoods were made. Before the detailed survey of the town was begun a considerable proportion of the citizens had learned of and carried out at their homes the sanitary measures needed and recommended for the homes in the county generally. Public sentiment for sanitation had been augmented and organized by the Women's Community Club formed early in the period of the survey. Thus the work in New Albany was begun with anticipation of favorable results.

Water supply.—The public water supply was obtained from a group of deep bored wells. The water as it left the wells was found to be of excellent sanitary quality. From the wells it was pumped to an underground reservoir. The walls of the reservoir were made of brick and cement. They were old and cracked and permitted seepage into the water from the polluted ground in the immediate vicinity of the reservoir. The water as it left the reservoir was found on bacteriological examination to contain a trace of contamination. The colon bacillus was found at times in quantities of 10 c. c., but very seldom in quantities of 1 c. c. From the reservoir the water was pumped through the mains and so was distributed to about 60 per cent of the dwellings in the town. At 30 to 40 per cent of the homes private wells were used as the source of water supply. Most of the private wells were dug wells provided with buckets and chain or rope for lifting the water. Practically all of them were exposed to pollution through surface conveyance or subsoil seepage from near-by insanitary privies. Water from them usually showed on bacteriological examination the presence of colon bacillus in 1 cubic centimeter.

Excreta disposal.—One hundred and fifty-five of the homes were provided with water closets connected with the town sewerage system. The sewage was discharged into the Tallahatchie River. Four hundred of the homes were not connected with the sewerage system, and at each of them insanitary, open-in-back, surface ("E") type privies were in use. At a considerable proportion of the homes connected with the sewer an insanitary privy in the yard was maintained for the use of servants. The town operated a scavenger service to clean the privies once a week. The scavenger work was faulty. Some of the matter was carried away in an open cart and buried. Most of it either soaked into the ground or was scattered about and worked into the ground about the privy by chickens and the scavenger. Thus the amount of excreta in the average privy at any time was not apparently large, but the pollution of the ground in the immediate vicinity of the privy was extensive.

Garbage, stable manure, and other refuse.—The town scavenger service removed garbage and other refuse to some extent. The use of water-and-fly-tight garbage cans was not required, and the methods of storing and disposing of garbage were faulty. Removal of stable manure was left to the judgment and convenience of owners of stables. Consequently it was not systematic nor sufficiently frequent, and numerous collections of manure furnished breeding places for flies.

Milk and other food supplies.—There was practically no official supervision over the milk supply. Most of the dairy farms presented insanitary conditions and faulty methods of handling milk. The screening of stores and other places at which foods were sold or prepared for sale was good, and these places were kept remarkably free from flies. The food inspector of the State board of health and the county health officer had been active and efficient in securing cleanly conditions and methods in the stores, hotels, and restaurants of the town.

TYPHOID FEVER PREVALENCE.

Complete records of cases of and deaths from typhoid fever in the county were not available. For the years previous to 1913 the prevalence of this disease can be estimated only roughly, but according to such data as could be obtained it appears that the rate had been high, probably considerably higher than the rate for the State of Mississippi as a whole. The number of deaths recorded in the county in 1913 was eight. According to the evidence obtained in the survey, this number was considerably below the actual, but it would give a typhoid death rate of about 41 per 100,000 of population.

Of 31,164 persons enumerated in 2,657 homes in the course of the survey, 1,489, or 11.3 per cent, gave a history of having had typhoid fever at some time, and 645, or 4.9 per cent. gave a history of having had typhoid fever within the decade. It has been found in counties having reasonably complete morbidity returns that such a canvass will fail to obtain histories of about 40 per cent of the cases which have occurred. The figures at their face value, however, give for the county an annual typhoid case rate of 1 for about every 200 persons. It is probable that considerably over 100 cases of typhoid fever occurred in the county in 1913, and that of these over 75 per cent developed in the period May 1 to December 1. In the corresponding period in the year of the survey, 1914, when special effort was made, with apparent success, to obtain prompt report of every case, only 29 cases were reported. Of these 29 cases, 1 developed in May, 4 in June, 18 in July, 5 in August, 1 in September, none in October, and none in November. The sharp decline in the prevalence after July appeared to be due largely to the improvement in general sanitary conditions, and particularly to the improved methods of bedside prophylaxis which had come into vogue. After July 1 every suspected case was visited promptly by the county health officer, usually in company with a Public Health Service officer, and the family was carefully instructed and shown how to carry out the precautionary measures. The visiting nurse engaged by the Community Club of New Albany also rendered highly effective service in getting carried out measures to prevent the spread of infection from cases.

SANITARY MEASURES RECOMMENDED.

The measures recommended for the country homes were (1) sanitary disposal of human excreta, (2) protection of water supplies from pollution, (3) protection of foods from flies and other filth-carrying agents, and (4) the prompt institution of precautionary measures at bedsides of cases recognized as, or suspected to be, typhoid fever or other infectious disease. In sections where malaria prevailed, antimalarial measures were recommended.

For New Albany the measures recommended were (1) the immediate repair of the walls of the reservoir to protect the public water supply from contamination and the construction as soon as practicable of a new reservoir; (2) the extension of the public water service as rapidly as practicable so that use of water from polluted private wells could be conveniently discontinued; (3) radical improvement in the scavenger service to effect (*a*) systematic and more nearly thorough removal of excreta from privies, (*b*) the liberal use of a disinfectant solution (one-half pound of chloride of lime to two gallons of water) on the soiled woodwork of and the ground under each privy after each cleaning, and (*c*) the use of covered, metal, water-tight cans as containers for the excreta in the process of collecting and of hauling the matter from privies to the burial ground; (4) the abolishment of all privies within the sewered area and the installation of sanitary water-closets in their place; (5) the modification of all privies which could not be immediately abolished to make them of sanitary ("A") type—with water-tight receptacles protected against invasion by flies; (6) extension of the sewerage system to cover all parts of the town as soon as practicable; (7) radical improvement in the system of collecting and disposing of stable manure, garbage, and other refuse, and (8) rigid enforcement of law requiring prompt report of cases of and deaths from infectious disease.

A recommendation made by the Public Health Service officers and the director of sanitation of the State board of health and strongly urged by representatives of the community club, of the business men's league, and of the medical society at meetings before the county board of supervisors was the creation of the position of whole-time county health officer. Two of the members of the board were favorable to creating the position at once, one was opposed, and two were open to conviction. All agreed that if public sentiment for a whole-time county health officer were developed to such a degree that a vast majority of the citizens of the county would make known their desire for it, the board would take the radical step of appropriating the money to create the office. The women's community club, the business men's league, and the county medical society carried out an active campaign to develop and to organize public sentiment. They circulated the following petition:

> Whereas it is now a matter of common knowledge that a reasonable expenditure of money and labor for the protection of public health is one of the wisest investments which can be made by a community; and
>
> Whereas the campaign for sanitation in this county recently conducted by the United States Public Health Service and the Mississippi State Board of Health has resulted in marked improvements in sanitary conditions throughout the county and has indicated the practicability of future advancements along such lines by having a force to continue the work; and
>
> Whereas the present appropriation from county funds for health work is entirely insufficient to secure the services of a reasonably adequate force to continue health work in the county which is obviously needed and for which there is an increasing popular demand:
>
> Therefore, we, the undersigned, taxpayers and voters and women of this county do request the board of supervisors of Union County to make at once from public funds provision for the maintenance of a county health officer at a salary of $2,000 per annum, and a sanitary inspector at a salary of $900 per annum.

The duties of the health officer to consist of: (1) General educational work, including public lectures, demonstrations, and the distribution of suitable literature throughout the county to inform the public about the prevention of diseases; (2) the medical inspection of schools; (3) the collection of mortality and morbidity statistics; (4) the enforcement of measures for the control of epidemics; (5) the investigation of water supplies, sanitary conditions, and all other matters pertaining to the public health; (6) the encouragement and application of practicable measures for the prevention of such preventable diseases especially as typhoid fever, hookworm disease, malaria, tuberculosis, diphtheria, and scarlet fever, including the establishment of neighborhood dispensaries for treatment of hookworm disease; (7) the microscopical examination of specimens to aid in the diagnosis of cases of communicable diseases; (8) medical practice for inmates of jail and poorhouse.

The duties of the sanitary inspector shall be to assist the health officer in the general work as above outlined and to go from neighborhood to neighborhood throughout the county to advise and demonstrate to owners and occupants of properties the most practicable, economical, and effective methods of securing for the protection of their families needed sanitary improvements.

Within two weeks after the campaign was started a large majority of the progressive and influential citizens had signed the petition and the success of the campaign seemed assured. Then, with the sudden and marked depression in the price of the county's staple crop, cotton, the citizenry of the county was confronted with a severe financial crisis, in the face of which the plan for a whole-time county health officer and sanitary inspector, along with other plans recognized as good but requiring the expenditure of money, was abandoned.

COOPERATION.

Throughout the period of the survey the mayor and board of aldermen of New Albany, the county business men's league, the county medical society, the county superintendents of schools, the clergymen, the newspaper men, and many other prominent citizens gave their hearty support to the work. The county health officer cooperated fully and, though paid poorly for part-time service as county health officer, devoted much of his time, day and night, which he could have given to his private practice, in assisting ably in carrying out the detailed work.

The board of aldermen of New Albany, with the permission of the county board of supervisors, had constructed and had exhibited for weeks on the front lawn of the county courthouse a model sanitary privy, which was an object lesson to country people coming to town.

One Sunday was set apart as "Sanitation Sunday," on which day all the clergymen in the county holding services preached on the theme of sanitation.

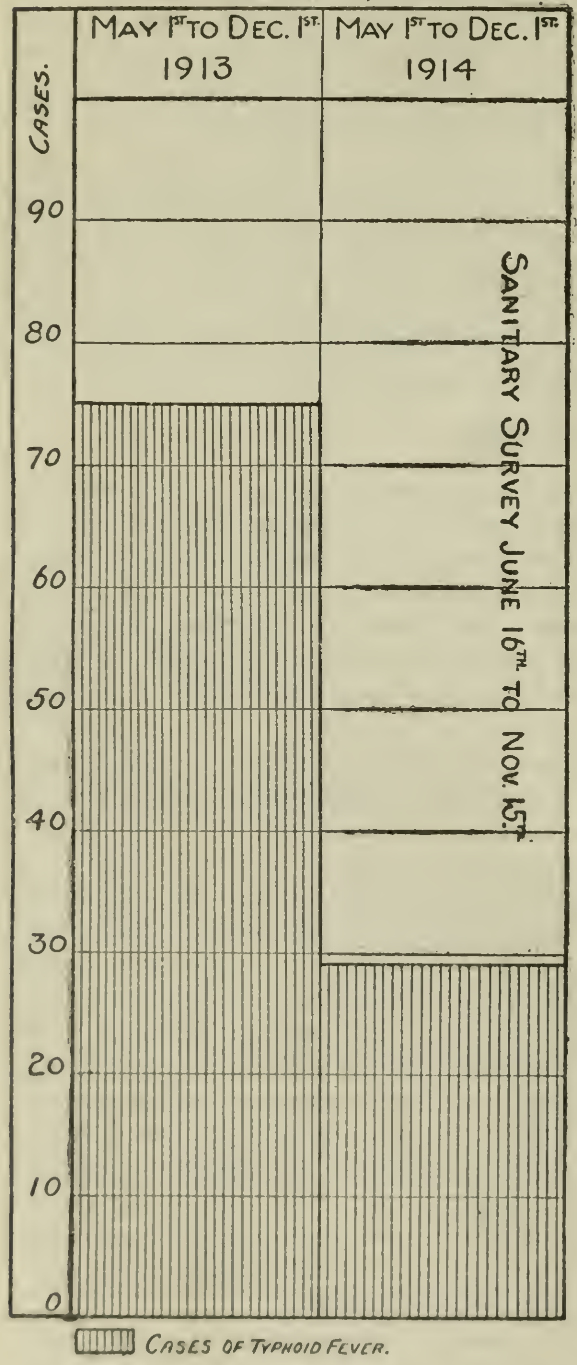
A few days after the survey in the county was begun a woman's club, known as the Union County Community Club, was organized in New Albany. This club had as its sole object the advancement of sanitation. Members were supposed to act individually to secure needed sanitary improvements at their own homes and in organization to secure community sanitary improvements. The organization soon after its formation had a membership of 600. Officers of the organization traveled over the county, addressed meetings and organized branches of the club in many different neighborhoods. The club raised money and furnished to the county the services of a health nurse. The community club was very instrumental in getting carried out in New Albany and other sections of the county the sanitary measures recommended.

The business men's league appointed a special committee to cooperate with the officers making the survey. This committee rendered exceedingly valuable assistance generally, and particularly in overcoming the objections of some of the property owners in New Albany who were apparently overconservative about expending small amounts of money to comply with reasonable sanitary requirements.

RESULTS.

From the remarkable interest and spirit of cooperation shown generally by the organizations and individual citizens, it was anticipated that tremendous sanitary advancement would be made in this county. But just at the time that the educational work had reached a point to be effective, the slump in the price of cotton (to only 5 or 6 cents a pound) occurred. The cotton crop had been produced largely on a credit basis, with a price of at least 12 cents a pound anticipated. In view of the financial crisis, it was encouraging for any degree of sanitary improvements to result immediately at the homes of the farmers.

CHART 7 :- TYPHOID FEVER REDUCTION FOLLOWING SANITARY SURVEY OF UNION COUNTY, MISS.



Country homes.—Groups of representative country homes in different neighborhoods were revisited to ascertain the degree of sanitary improvement accomplished subsequent to the first visit of survey. The aggregate number of homes in these groups was 442. At 29 (or 6.5 per cent) of these 442 homes high-grade sanitary privies with water-tight receptacles and of fly-proof construction had been installed in the place of grossly insanitary open privies. At two other of the homes the privies had been markedly improved, but were not quite of sanitary "A" type. At over 5 per cent of the homes measures—such as curbing, casing, ditching, or installation of pumps—had been carried out to secure better protection of water supplies against contamination.

New Albany.—The walls of the old reservoir were repaired and made water-tight within a few days after the recommendation about the reservoir was made to the board of aldermen. Since the survey of the town was made the public water and sewerage systems have been extended and a large proportion of the private wells and privies abolished. The scavenger service was improved immediately after the recommendations for same were made. From the early part of July the cleaning of privies was much more effective, and disinfectant solution was applied in each privy once a week. An ordinance requiring weekly removal from the town of stable manure was enforced. This measure, along with improvement in the privies, extensive trapping of flies (fostered by the community club), and improved garbage-collection service, was followed by a tremendous reduction in fly prevalence. On August 8 the board of aldermen passed an ordinance requiring all privies within the corporate limits of the town to be made of sanitary type. Before this ordinance became effective a large majority of the privies had been remodeled so as to be of sanitary type. Soon after the ordinance became effective, on September 8, a resurvey was made, and all of the 400 privies, with not more than 5 exceptions, were found to be of sanitary construction and to be kept clean by a systematic and adequate scavenger service.

Typhoid fever reduction.—According to all evidence which can be obtained, a marked reduction in typhoid fever (chart 7) and other diseases which result from filth-borne infection was effected for the county as a whole and particularly for New Albany. It is unfortunate that accurate morbidity records for New Albany have not been made; hence, a comparison between the year before and those after the survey can not be presented. The practicing physicians stated that in the several months following the clean-up work there was scarcely any sickness of an acute nature in the town and that never had there been within their recollection such a small number of cases of typhoid fever and of infant diarrhea in the community at that season of the year.

SUBSEQUENT PROGRESS.

The following excerpts from a letter, dated December 15, 1917, from the president of the Union County Community Club and the recording secretary of the Mississippi Federation of Women's Clubs, received by the writer in response to an inquiry about progress in sanitation in New Albany and vicinity, will give some idea about the continuing influence of the work begun in Union County in 1914:

> I am still enthusiastically interested in the campaign for rural sanitation and eager to know the definite results. Will you please, therefore, have two copies (of the report) sent to me, one for our chairman of public health and one for myself?
>
> Every house, white and black, in New Albany now has sewerage and city water. Mr. Rowell came in as mayor last January and rigidly enforced the two ordinances that were passed by the board at the time of the campaign here (in 1914).
>
> Several of the rural schools now have sanitary closets, where none had them before, and all of the teachers at the last teachers' meeting I attended said they were working for them in their districts.
>
> A few days ago I saw a sanitary closet being built near Ingomar.
>
> Last summer there was one case of typhoid fever near my miniature farm, and every person in the neighborhood knew the precautions to take and took them.
>
> Another advance that the Public Health Service may claim partly is the bill that is to be introduced in the 1918 session of the legislature—a bill for full-time county health officers—through the instrumentality of the Federation of Women's Clubs. The plan for this bill grew out of your address to the convention at McComb.
>
> I regret that there is so little that is tangible to report. There is so much that is intangible—the general right knowledge about sanitation, the changed attitude of the people toward movements for public welfare—a greater receptivity, as it were—the unconscious growing demand for better conditions.
>
> And I do hope that the undertaking as a whole is the success you dreamed of. Nothing else has ever so appealed to my imagination as its possibilities.

SANITARY SURVEY OF DORCHESTER COUNTY, MD.

With the limited appropriation and with the necessarily small force available for the work, it was not contemplated that the rural sanitary survey by the Public Health Service would be extended to more than three counties in 1914. An offer from the State Board of Health of Maryland, however, made it possible, after the work was well advanced in the first three counties, to include a fourth county. To obtain a survey of a county in Maryland the board of health of that State offered to furnish more than half of the force needed to do the work. A reorganization of the State health department was being effected, and the board desired the whole-time health officers (health wardens), who were to be assigned to the 10 health districts into which the State was divided to become familiarized with the plan of sanitary survey inaugurated by the Public Health Service.

The county selected for the survey was Dorchester. This county is located in the section designated as the "Eastern Shore" of Maryland and forms a part of the peninsula between Chesapeake Bay and the Atlantic Ocean.

The survey of Dorchester County was begun on July 10, 1914, and terminated on November 15, 1914.

The personnel of the force engaged in the work consisted of three Public Health Service officers, six health wardens, and two health inspectors from the State board of health. The three Public Health Service officers, and, on an average, five of the State board of health officers were engaged actively in the work throughout the period of the survey. An excellent spirit of teamwork was maintained in the force. The Public Health Service officers were under the general direction of Surg. L. L. Lumsden, and in his absence Asst. Surg. J. B. Laughlin was in immediate charge. The State board of health operations were under the direction of Dr. John S. Fulton, then secretary of the Maryland Board of Health. The plan of work in Dorchester County was the same as that carried out in Berkeley County, W. Va., Lawrence County, Ind., and Union County, Miss.

GENERAL CONDITIONS.

Dorchester County is bounded on the north by Caroline County and the Choptank River, on the east by Wicomico County and the State of Delaware, on the south and west by Chesapeake Bay. Meridian 76° of longitude and parallel 38° 30′ of latitude intersect at about the geographical center of this county. Dorchester is the largest of the Eastern Shore counties, with an area of 576 square miles, and a population of 28,669. The number of people to the square mile is 49.8 for the county as a whole and 38.6 for the rural districts.

The surface of the county generally is flat and only a few feet above sea level. Extensive stretches of land in the southern half of the county are in marsh. A considerable proportion of the swamp land is covered with salt water at high tide. The soil is a sandy loam. The ground water rises to the surface

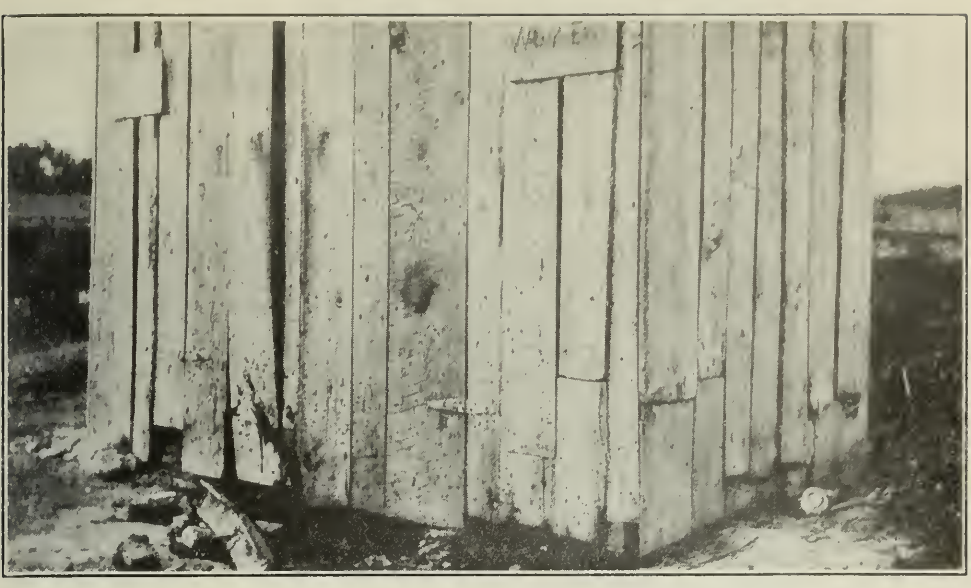


Fig. 26.—A typically insanitary privy in use by a large number of employees at one of the canneries in Dorchester County, Md.

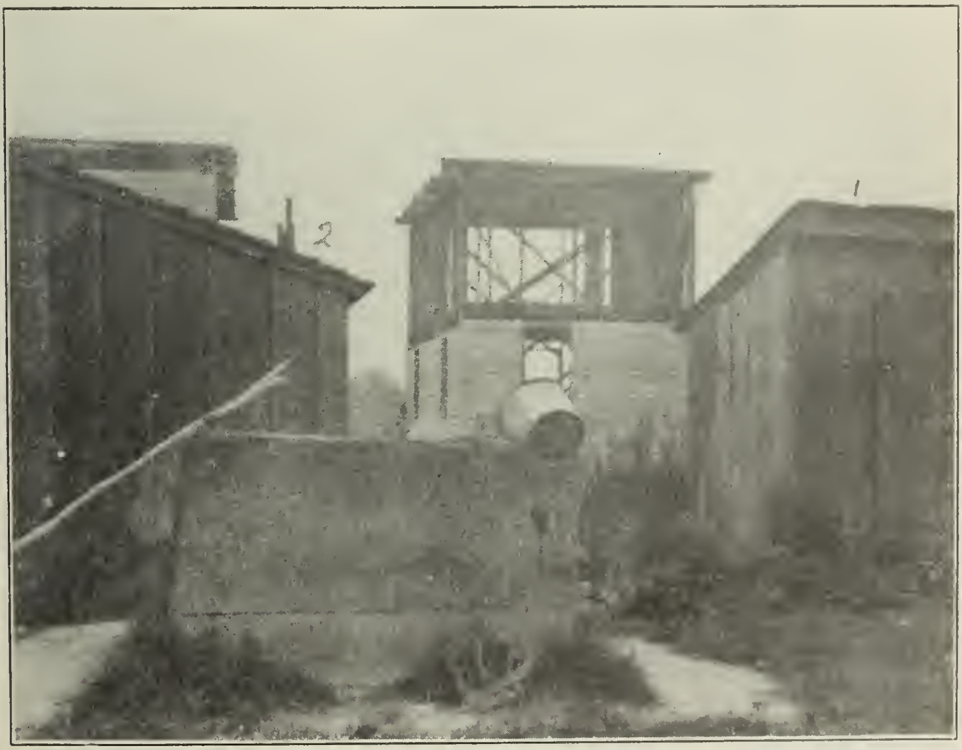


Fig. 27.—Insanitary well polluted by drainage and seepage from nearby insanitary privies which was used as source of water supply by about 25 families in Cambridge.

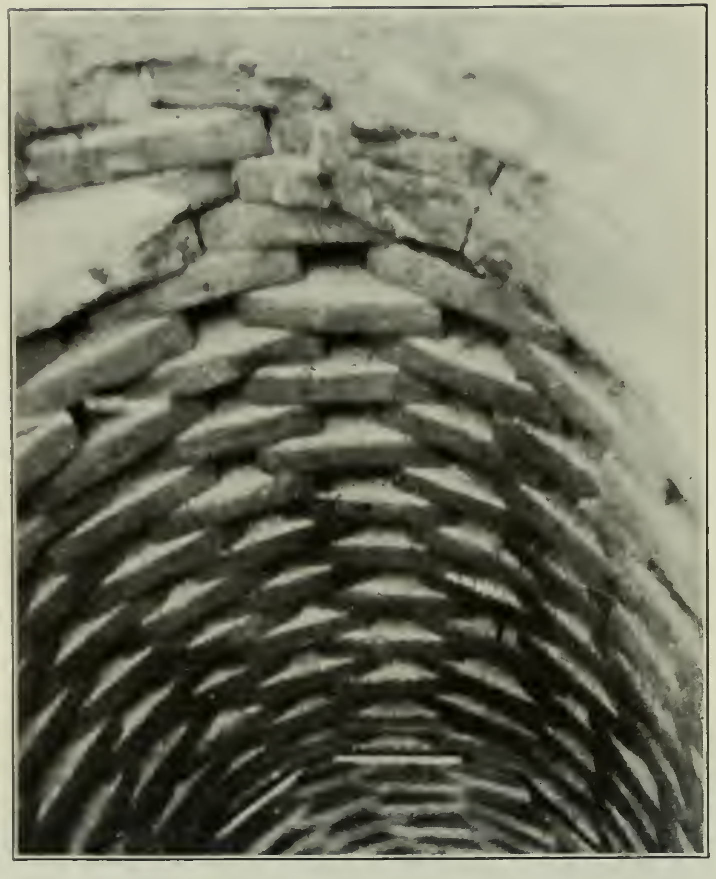


Fig. 28.—Photograph of loose brick wall of well. Dorchester County, Md.

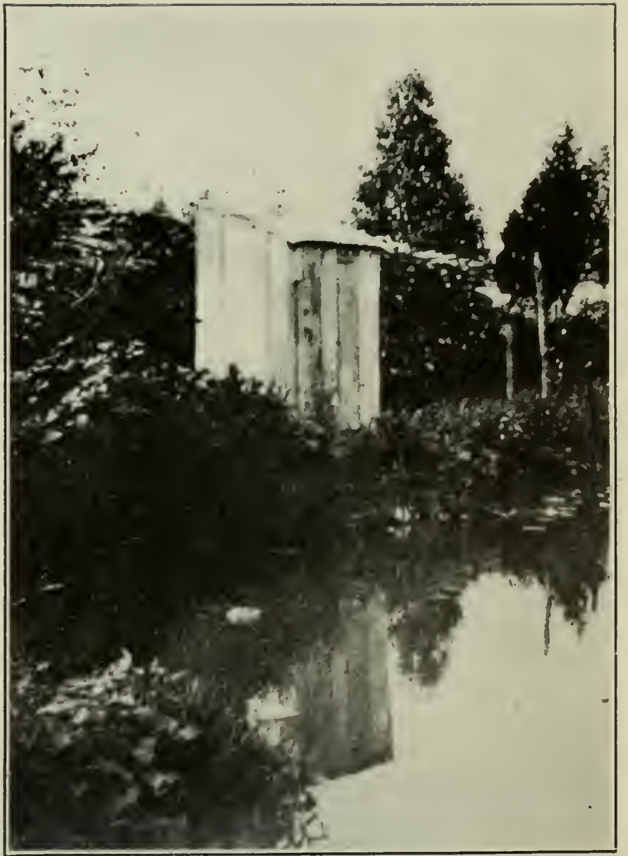


Fig. 29.—Open insanitary privy overhanging pond from which ice was harvested for domestic use in Dorchester County, Md.

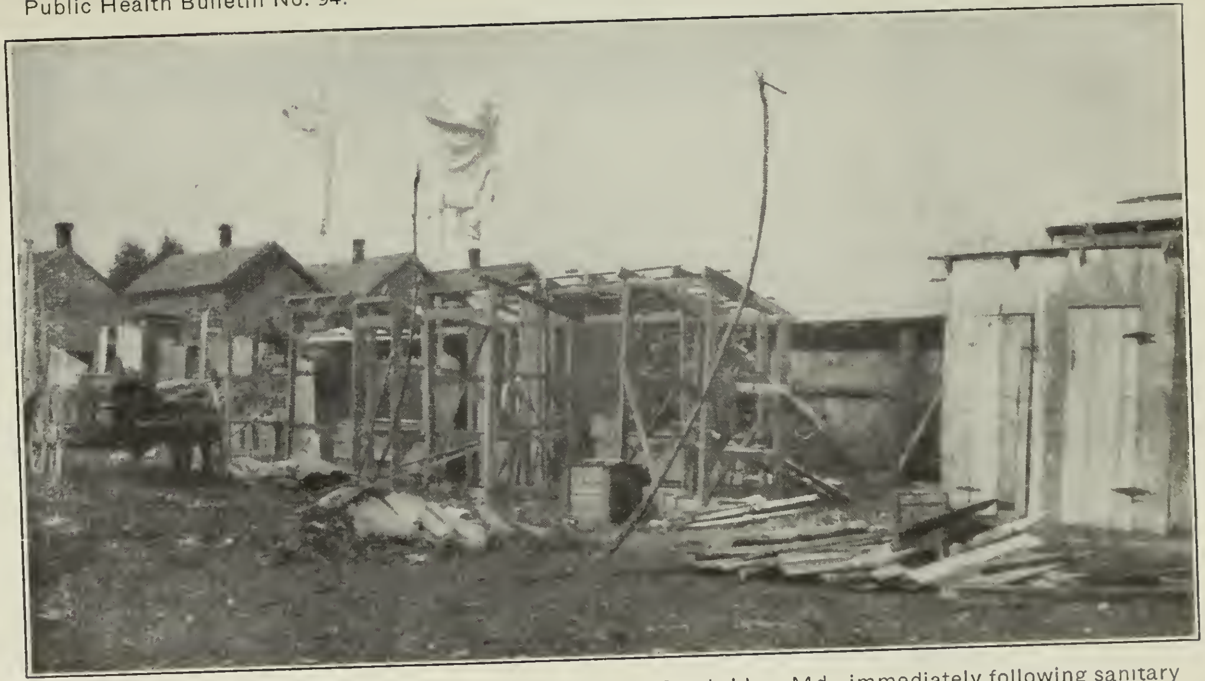


Fig. 30.—A row of sanitary privies under construction in Cambridge, Md., immediately following sanitary survey of the town.

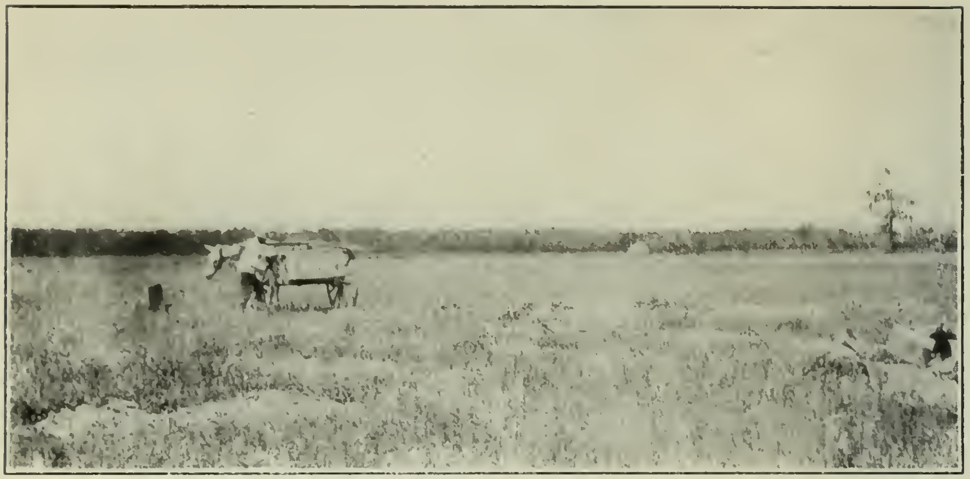


Fig. 31.—Method of disposal of privy contents at Cambridge, Md., before the sanitary survey. The matter was dumped on the surface of the ground and left uncovered in a field in the outskirts of the city. The deposits shown in the photograph were within 600 feet of a thickly built up part of the city and there served as a feeding and breeding place for flies.

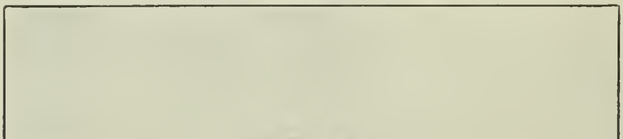


Fig. 32.—Method of disposing of privy contents at Cambridge, Md., after the sanitary survey. The matter was treated with chloride of lime solution, placed in covered water-tight cans, hauled to the disposal field, and there spread in shallow furrows and carefully covered with several inches of earth.

in many places, and for the greater area of the county is between 2 and 5 feet below the surface. The surface sand-loam stratum averages about 7 feet in depth and rests on a clay stratum. The numerous and extensive fresh-water marshes furnish ideal breeding places for mosquitoes. In the late summer and early fall weeks Anopheline mosquitoes are very abundant in most sections of the county; but, according to the statements of the practicing physicians and the evidence obtained by the survey, malaria in recent years has been of very rare occurrence in any section of the county. Why this is the case is difficult to understand unless it results from some peculiar biological condition. The relative isolation ot the Eastern Shore country from the main highways of travel does not appear to be a satisfactory explanation of the phenomenon.

In most parts of the county an abundance of potable water can be obtained by driving a pipe to a depth of less than 20 feet from the surface into a sand-gravel stratum which lies under the clay stratum. Artesian water of excellent quality can be obtained at a depth ranging from 200 to 500 feet.

The soil is very fertile and for the greater area of the county in a high state of cultivation. Agricultural experts state that the farm lands of Dorchester County are second to none in the United States for general productiveness. Wheat, corn, hay, and truck are the staple crops. The canning of vegetables and fruits is a big local industry. It is stated that over one-twelfth of the annual tomato crop in the United States is raised and canned in Dorchester County. There are about 50 canneries in the county. For picking the tomatoes and operating the canneries a floating population of about 2,000 is brought into the county for a period of about 10 weeks every year.

Practically all of the public roads of the county are good. There are 80 miles of concrete and macadam roads and 125 miles of shell roads.

The incorporated towns in the county are Cambridge, the county seat, with a population of 6,407, and Hurlock, East New Market, Vienna, and Secretary, with populations respectively of 516, 280, 332, and 409 (census, 1910).

PLAN AND SCOPE OF SANITARY SURVEY.

The work comprised (1) a canvass and a sanitary survey of all the rural homes in the county; (2) a sanitary survey of the five incorporated towns; (3) a sanitary survey of all schoolhouses, churches, railway stations, post offices, and stores in the rural districts; (4) public addresses on the subject of sanitation, with lantern-slide illustrations, in all sections of the county; (5) distribution of literature on different phases of the subject of sanitation; (6) the founding of special organizations for the advancement of sanitation; and (7) the epidemiological investigation of cases of typhoid fever as they developed.

Headquarters were established in Cambridge. For the survey of the country homes the county was divided into four districts, separated by readily recognizable boundaries, such as streams, railroads, and wagon roads. Two or more of the field men were assigned to each district and worked out from some central point, as a rule a town or a village, in the district. The field men remained in their districts all week and came to Cambridge on Sunday for conference. Horses and buggies and automobiles were used for transportation. The latter proved the more advantageous because of the good condition of the roads. All homes in the country districts were canvassed and surveyed. Surveys—including a house-to-house visit—in the five towns were made soon after the work in country neighborhoods was begun. The complete survey of each town was made at the special request of the town council. The studies were facilitated by the intelligent interest manifested by the citizens generally. In the course of the visits to the homes, the investigators did not fail in a single instance to meet with a reasonably cordial reception. The citizens generally appeared progressive and to take an interest in all matters which concerned their welfare.

Good publicity was given to the work at the outset by a series of public meetings, which were remarkably well attended.

The day after the force of workers arrived in the county two meetings were held in Cambridge. The first, in the afternoon, was with the county medical society. Sixteen practicing physicians were present and all promised to support the work. The second meeting, held in the evening, was for the public and was attended by over 1,500 persons. This mass meeting was addressed by Drs. Fulton and Lumsden, who explained the plan and purpose of the survey, and by the city health officer of Cambridge and the State comptroller, who urged the people to cooperate in the work to be given the county by their National and State Governments. The following afternoon (Sunday) a mass meeting for men only was held in the Cambridge theater. Over 600 men were present. Following the address of the sanitary officer who explained in plain terms the salient measures of sanitation needed in the county, the governor of the State made a stirring address urging the men present to give their hearty support to the sanitary program. The following afternoon (Monday) a meeting of the ladies from different sections of the county was held at one of the churches in Cambridge. At this meeting, attended by about 400 ladies, the organization of a woman's sanitation club was suggested. The suggestion was acted upon at once. Officers were elected and about 200 members enrolled. By November 1, this organization, known as the Dorchester Community Sanitation League, had a membership of over 1,500. In its plan of organization and work it was similar to the community clubs of Berkeley, Lawrence, and Union Counties.

Besides the meetings in Cambridge within the first 10 days of the work, public meetings were addressed in representative centers throughout the county. Thus the citizens generally, before the survey reached their homes, became informed about the plan and purpose of the work.

Four thousand and nienty-one country homes and 2,260 town homes were canvassed and surveyed. Seventy-eight schools, 52 churches, and 4 camp-meeting grounds in the rural districts were inspected. Thirty-five public lectures on sanitation were given. The average attendance at the lectures was 142 persons.

For a period of three weeks during the survey, the State board of health of Maryland had a cannery inspector and a veterinarian in the field. These men inspected the canneries and dairy farms of Dorchester County, and made recommendations for needed sanitary improvements. In addition to these special inspections, the men engaged in the regular survey inspected 13 dairies in their routine inspections of homes. At these homes especial stress was laid upon the part played by milk in the spread of typhoid and other diseases. The people were told how milk became contaminated and how it could be kept clean if a little care and common sense were used, and a strong plea was made to have sanitary privies built and milk rooms screened.

After the first round of survey had been completed, about 50 per cent of the country homes and practically all of the town homes were revisited to ascertain what sanitary improvements had been made as a result of the educational work.

FINDINGS IN RURAL SECTIONS.

Race.—Of the 4,091 homes visited, 2,711 were occupied by white families, 1,185 by colored families, and for 195 information as to the race of the occupants is not recorded.

Number of rooms to house:	Dwellings.
With 1 room	85
With 2 rooms	466
With 3 rooms	464
With 4 rooms	792
With 5 rooms	582
With 6 rooms	726
With 7 rooms	321
With 8 rooms	289
With 9 rooms	110
With 10 rooms	78
With 11 rooms	34
With 12 rooms	16
With 13 rooms	10
With 14 rooms	11
With 15 rooms	4
With 16 rooms	3
With 20 rooms	1
Not stated	99
	4, 091

General appearance of residence.—One thousand four hundred and sixty-eight of the homes were recorded as good, 1,270 fair, 1,314 poor, and for 39 homes the appearance of the residence was not recorded.

Construction of house:	
Frame	4, 026
Brick	14
Cement	6
Stone	1
Not stated	44
	4, 091

General cleanliness.—This applies to refuse, such as waste paper, rags, ashes, tin cans and leaves, to garbage and other kitchen refuse, to litter from stables, pigsties and chicken pens, scattered about the yard, and to obvious collections of dirt inside the dwellings. The general cleanliness was recorded as good for 1,635 homes, fair for 1,307 homes, poor for 960 homes, and for 189 homes information as to general cleanliness was not recorded.

Cellar or basement.—One hundred and fifty-two homes had cellars or basements, 3,912 had none, and for 27 the presence or absence of a cellar was not recorded.

Screening in summer.—At 1,357 homes the screening of dining room and kitchen was complete, at 1,360 the screening was incomplete, and at 1,287 (or 32.14 per cent), there was no screening at all. For 87 homes data as to screening were not recorded.

Animals on premises.—At 3,755 homes some kind of farm or domestic animals were kept, at 333 no animals were kept, and for 3 homes there are no data recorded on this point.

Stable manure.—Of all the homes in the county at which animals were stabled, at only 11 was there adequate provision made to prevent stable manure from serving as a breeding place for flies.

Disposal of human excreta.—Of the 4,091 homes visited, 19 were provided with water-closets, 2,733 with privies, and 1,294 (or 31.98 per cent) were without toilets of any kind. For 45 the presence or absence of a toilet is not recorded. Of the 2,733 privies in use, 1,798 were of the insanitary open-back surface type, only 25 were of the sanitary "A" type, 31 were "B" type, 25 "C" type, and 854 "D" type.

At 3,882 of the homes definite data were obtained as to the final disposal of human excreta, as follows: At 19 of the homes, at which water-closets were in use, the sewage was discharged into creeks or rivers; at 95 homes, at which privies were in use, the privies were on the banks of or overhung creeks, and their contents, to some extent, were carried away at high tide; at 3 homes privy contents were systematically burned; at 1,357 homes privy contents were buried; at 725 they were used as fertilizer; and at 83 they were thrown into woods or streams; at 1,600 homes the disposal of human excreta, whether as promiscuous deposits or as insanitary privy contents, was left to animals, drainage, and seepage, and the natural agents of purification.

In 1,581 instances where privies were in use, it appeared likely that privy contents would get into the yard, truck patch, or fruit grounds, by being carried by domestic animals or on the feet of persons, or by drainage or seepage. In 725 instances privy contents were used regularly to fertilize land in which truck was raised. At 454 homes privy contents were likely to get into the water supply.

Water supply.—Water for drinking and culinary purposes was obtained from the following sources: For 3,668 homes from wells, for 22 from springs, for 357 from cisterns or rain barrels, for 1 from a stream, for 29 from city water supply, and for 14 homes data as to source of water supply were not recorded. Four hundred and eighty-five families used water from neighbors' supply, and 13 from a community well. Of the wells in use, 1,915 were bored, 919 dug, and of 337 the character was not recorded. One hundred and forty-seven of the bored wells were artesian.

Of the 3,171 wells in use, 1,323 were less than 20 feet deep, 697 were from 20 to 40 feet deep, 206 were from 40 to 60, 52 from 60 to 80, 6 from 80 to 100, 56 from 100 to 200, 386 were 200 feet or over, and for 445 the depth was not recorded. One thousand four hundred and ninety-eight wells were provided with tight platforms; 1,326 were provided with cement or other good curbing.

Of all the homes visited, in 3,207 cases the users regarded the water as safe, and in 301 cases it was regarded as unsafe. Five hundred and eighty-three cases were not recorded as to the opinion of the users on this point. In contrast to this was the opinion of the inspector, who in 2,218 cases considered the water safe, and in 1,275 cases unsafe. In 598 cases the inspector's opinion on this point was not recorded.

Schools.—Seventy-eight rural schools were surveyed. Of these 57 were for white children and 21 for colored. At none of the schools was there a toilet even approaching a sanitary type. Eight of the 78 schools did have boards placed in the back of the privy to prevent the access of dogs and chickens to the filth, but even in these the filth was easily accessible to flies and was the cause of extreme soil pollution. Sixty-three of the schools had the old open-back privy, polluting the soil, accessible to animals and a menace to the health of the community and the pupils of the school. At seven schools there were no toilets of any kind.

The water supply for five of the schools came from a flowing or artesian well. For seven schools the drinking water was obtained from deep wells furnished with pumps. Thirty-six schools had shallow driven wells. Twenty-five schools had dug wells, with buckets. In three schools the drinking water was obtained from cisterns, and in two schools from rain barrels.

Churches.—Fifty-two churches were surveyed, 33 white and 19 colored. Two white churches got water from artesian wells. One white and one colored church got water from deep wells provided with pumps. Ten churches (two white and eight colored) obtained their water supply from shallow driven wells, and one church (white) got water from a rain barrel. For 37 churches (27 white and 10 colored) water supplies were obtained from private sources in the neighborhood. Thirty-eight churches had no toilets of any kind. Thirteen churches had insanitary "E" type privies, accessible to animals and polluting the soil. At one church the privy was boarded up in the back to prevent the ingress of the larger barnyard animals, but was not screened against flies and was a source of soil pollution.

Camp-meeting grounds.—Four camp grounds used every year for religious revivals were surveyed. Two of the camps are for whites and two for colored. The camps are located in different sections of the county. The revivals begin in the latter part of July and continue for two to four weeks. To accommodate those who wish to live at the camp during the revival, permanent wooden shacks, which when in use are covered with canvas, are erected. The following is an excerpt from the report of the officer who inspected the camps while the revivals were in progress:

> The permanent occupants at each camp number 50 to 150. On Sundays, however, 1,500 to 2,000 people come to the meeting and spend the day. Many of these people, and some of the residents, eat at the common dining hall, which is unscreened. As is to be expected, there are enormous numbers of flies that take their meals with the diners, although they run some risk of being swallowed alive or of being crushed by some one's hand. Toilet facilities consist of very foul, open-back privies and the bushes ,both being used about equally, especially at night and on Sundays when the large crowds assemble. The water supplies of the camps visited were considered to be safe.
>
> Out of the large number of people visiting the camp there are undoubtedly some who harbor the typhoid bacillus, and, as there are abundant opportunities for contagion to be spread from feces to food through the medium of fingers and flies, it is no wonder that cases of typhoid fever develop every year, which are attributable to the insanitary conditions at these camps.

Canneries.—Besides the several large canneries in Cambridge there are about 50 canneries in the rural sections of the county. The laborers with their families compose a floating population of about 2,000 in the county for a period of about 10 weeks every year. The laborers consist mainly of negroes and Bohemians brought from Baltimore, Philadelphia, and the surrounding vicinities. The sanitary conditions under which these families live were found at the canneries generally to be very poor. They lived herded together in poorly constructed barracks. In many instances there was overcrowding in the living quarters—more than six persons sleeping in one small room. As a rule cooking was done at outside fires and no attempt was made to protect food from flies. The unusually large collections of cannery waste—tomato skins, etc.—furnished abundant breeding places for flies, and at most of the canneries flies literally "swarmed." The toilets generally were inadequate in number, of insanitary ("E") type, and very foul (fig. 26). Promiscuous deposits of human excreta in the immediate vicinity of the barracks usually amounted to more than the privy contents.

County health administration.—The administration of health affairs in the county comes under the jurisdiction of the State health warden of the ninth sanitary district of Maryland. Dorchester and Talbot Counties compose this district. The health warden is engaged by the State board of health for whole-time service. Throughout the period of the survey he was a member of the regular working force and gave excellent cooperation.

Findings in incorporated towns.

	Cambridge.	Hurlock.	Vienna.	Secretary.	East New Market.	Total.
Number of homes canvassed and surveyed	1,866	131	91	89	83	2,260
RACE OF FAMILIES.						
White	1,081	115	80	82	77	1,435
Colored	600		4	3		607
Not stated	185	16	7	4	6	218
Total	1,866	131	91	89	83	2,260
EXCRETA DISPOSAL.						
Number of homes having water-closets only	256	8		1		265
Number of homes having privies only	1,386	113	90	87	75	1,751
Number of homes having both water-closets and privies.	189	6	1		7	203
Number of homes having neither water-closet nor privy				1	1	2
Number of homes at which type of toilet was not recorded	35	4				39
Total	1,866	131	91	89	83	2,260
TYPE OF PRIVY.						
A	20	5			3	28
B	11	1	3		2	17
C	4	1				5
D	506	77	41	17	48	689
E	963	29	45	57	27	1,121
Not stated	71	6	2	13	3	107
Total	1,575	119	91	87	83	1,967
PRIVY CLEANED.						
Once a week or oftener	23	10	11	6	9	59
Two or three times a month	26	7	4			37
Once a month	318	28	15	11	11	383
Every two months	229	6	5	3	8	251
Every three or four months	119	15	13	16	15	178
Every six months	39	3	15	7	9	73
Once a year	14	3	6	3	8	34
Not cleaned or not used	85		2	8	4	99
Not stated	722	47	20	33	18	840
Total	1,575	119	91	87	82	1,954
SCREENING OF DINING ROOM AND KITCHEN.						
Complete	1,011	96	72	59	71	1,309
Partial	24	1	1	6	3	35
None	387	5	10	12	3	417
Not stated	444	29	8	12	6	499
Total	1,866	131	91	89	83	2,260
SOURCE OF WATER SUPPLY.						
City tap	923	32				955
Street hydrant	477	8				485
Private well on property	141	10	43	59	75	328
Neighbor's well	45			1	2	48
Public pump	7	66	37	27	4	141
Not stated	273	15	11	2	2	303
Total	1,866	131	91	89	83	2,260

The public water supplies of the towns were obtained from deep bored wells and were of good sanitary quality. About 50 per cent of the private supplies were from bored wells, furnishing water of good sanitary quality, and the remainder were from dug wells, with buckets, furnishing water generally of bad sanitary quality (figs. 27 and 28).

The sewage, along with a large quantity of waste from the tomato canneries, of Cambridge was discharged into the harbor, which is designated as a part of the "Choptank River." There is at this point, however, but little current in the "river" except that caused by the tides and wind. In the canning season the combination of putrescible sewage and tomato juice discharged into the harbor produces a stench which is inconceivable to one who has not suffered from it. As a result of the fermentative action in the water, fish are killed and the decomposition of their bodies adds to the stench. On the suggestion of the writer, the cannery waste in the summer of 1914 was heavily dosed with hypochlorite of lime, and it was stated generally by the citizens that the stench from the harbor that year was very much less than it had been in previous years.

With the exception of the few which were of sanitary type, the privies in the towns were very faulty from every standpoint. The average privy at the time of the survey contained about 4 bushels of excreta (fig. 29).

On account of the numerous exposed collections of privy contents, stable manure, and cannery waste, flies were abundant in Cambridge. The number in the summer of 1914 was said to have been reduced much below the usual for the season by an extensive plan of trapping which had been carried out since the early spring under the auspices of the Cambridge woman's club.

The city health force in Cambridge consisted of a part-time health officer and two sanitary inspectors. While the survey was in progress the Cambridge woman's club employed for work in the city a visiting nurse, whose services were expected to be permanent. The city health officer heartily supported the work and ably assisted in it. The sanitary inspectors, due to physical disability, were not active.

TYPHOID-FEVER PREVALENCE.

In view of the prosperity and of the progressiveness of Dorchester County in farming and other industries and in good-road construction, it is remarkable that so little progress had been made in sanitation. Notwithstanding the exceptionably good water supply for the county as a whole, the annual typhoid-fever rate of Dorchester County had been consistently high. For the decade ending 1914 this county stood near the top of the list of Maryland counties having high typhoid-fever rates. With 29 deaths from this disease reported in 1913, Dorchester County had in that year a typhoid-fever death rate of 101 per 100,000 of population. Twenty-seven of these deaths occurred in the last six months of the year.

The insanitary disposal of human excreta generally in the county, and especially in the crowded centers, the situation in connection with the canneries, camp meetings, schools, and churches, and possibly some peculiar climatic factor readily account for the high typhoid prevalence.

Of 20,455 residents of the county who were canvassed in the course of the survey, 2,117 (or 10.3 per cent) gave a history of having had typhoid fever. Since the history given depended on the memory of many different individuals unaccustomed to answering questions asked by a stranger, the actual percentage of residents who had had typhoid fever was probably considerably larger than 10.3.

In the period January 1, 1913, to October 1, 1914, 278 cases were reported through the regular channels for the collection of morbidity statistics in the State. The house-to-house canvass elicited histories of only 244 cases for this period.

The insanitary conditions, the high typhoid prevalence, the extensive cultivation and shipment of fruits and green vegetables, and the finding that at 725 farms in the county untreated human excreta were used as a fertilizer—frequently on truck patches—are of importance from a standpoint of preventing the spread of disease through interstate commerce.

SANITARY MEASURES RECOMMENDED.

For the country homes the sanitary measures recommended were (1) installation of sanitary privies, (2) boring of wells to provide clean water supplies in place of polluted supplies from dug wells and unprotected springs, (3) systematic spreading of stable manure to prevent fly breeding and screening of dwellings to protect foods from flies and persons from mosquitoes, and (4) prompt institution of precautionary measures whenever cases suggesting typhoid fever, malarial fever, or other infectious disease occurred. The importance of sanitary disposal of human excreta was especially stressed in this county.

For the towns the measures especially recommended were (1) an immediate clean-up and treatment with disinfectant of all privies and cesspools; (2) abolishment of privies and installation of water closets in their stead in all sewered areas; (3) have all privies needed for use either rebuilt or remodeled so as to be of sanitary type; (4) extension of public water supply and sewerage systems as rapidly as practicable; (5) improvements in methods of collecting and disposing of garbage, stable manure, and other refuse; and (6) screening and reasonable cleanliness at all places at which foods were sold or prepared for sale. The citizens and the municipal authorities of the towns were urged to concentrate their efforts first on the most salient feature of sanitation needed in the towns—the cleanly disposal of human excreta.

COOPERATION.

Hearty cooperation in the work was obtained from the county medical society, the Cambridge Board of Trade, the local newspapers, the local civic organizations, the town councils, and from prominent citizens quite generally.

The Cambridge Board of Trade and the Cambridge branch of the Dorchester Community Sanitation League were particularly instrumental in getting carried out sanitary measures in Cambridge. The Maryland Board of Health sent to the county, besides its members of the regular survey force, a cannery inspector and a dairy inspector. These inspectors visited all the canneries and dairies, and issued to the operators definite instructions, in accordance with a then recently enacted State law, for needed sanitary improvements.

The Dorchester Community Sanitation League, formed for the special purpose of cooperating in the work to advance sanitation throughout the county, organized branches in all the principal sections of the county, and by November 1 had a total membership of over 1,500. The ladies of this league worked arduously and ably. They accomplished considerable in the way of concrete results and did a great deal along educational lines. Immediately before the survey of Cambridge was made by the sanitary officers, members of the community league detailed by their officers visited every home in the city, explained to the women in the households the plan and purpose of the survey, and urged them to use their influence to get the sanitary measures carried out.

To secure chairmen for local branches in different sections of the county, the league soon after its formation sent from its headquarters throughout the county the following circular:

DORCHESTER COMMUNITY SANITATION LEAGUE,
Cambridge, Md.

DEAR MADAM: You doubtless already know that Dorchester County is one of the four counties in the United States where a Government health survey is being made. The authorities are asking the county for its hearty support and earnest cooperation in the work of making it a model of sanitation and healthfulness. As an important step in this direction, every woman in the county is asked to join the Dorchester Community Sanitation League. This league has been organized with headquarters and general officers in Cambridge. It is planned to have a chairman and standing committee in each city ward and county district, and you are asked to be chairman in your district. There are no dues to the league, and its only condition of membership is the promise to keep one's own premises in proper sanitary condition and by example and encouragement to help others do the same. Every chairman will appoint her own standing committee of any number she desires, and with their aid will endeavor to enroll in the league the name of every woman in the district. She will also keep in touch with the central office, which will endeavor to give her any aid in its power.

Making our beautiful county a perfectly clean and healthful one will mean work, but surely it is work in which every county woman ought gladly engage, and it is earnestly hoped that you will be willing to lead the campaign in your locality.

Please write to Miss Elinor Annan and accept this office, or, if that is not possible, write to her and suggest some one who will. Further information will then be sent.

Yours, for sanitation and health,

MRS. JAMES C. LEONARD,
President,
MRS. C. L. SELOVER,
Vice President,
MRS. JAMES B. NOBLE,
Recording Secretary,
MISS ELINOR ANNAN,
Corresponding Secretary,
MRS. E. MILTON SKINNER,
Treasurer,
Officers of the Dorchester Community Sanitation League.

In soliciting members the league distributed by hand or mail to most of the homes in the county the following circular:

Will you join the Dorchester Community Sanitation League?

THERE ARE NO DUES.

The object of this club is to make Dorchester County clean and healthy.

The only obligation you assume is to try and have your premises kept in a sanitary condition. This means that you will take simple and inexpensive precautions against filth and flies.

The important fact to be impressed upon the people of Dorchester County is that typhoid fever and like diseases come from people. The infection may get to people in water, milk, or food, but it starts only from people. To understand this is to be able to control the disease. This fact has never before been brought to our attention in this clear-cut and convincing way.

Ten sanitary experts are now in Dorchester County for the purpose of advising all who desire advice. The physicians of Dorchester County have been instrumental in bringing these sanitary officers to the county, and the indorsement of our own physicians should be accepted as sufficient.

To be a member of the community club means that you will carry out the advice of these visiting experts to the best of your ability.

Women are the real housekeepers of the community, as well as of the home, and it is for us to decide whether typhoid fever shall be allowed to remain or shall be driven out of Dorchester County.

If you wish to share in the fight against filth and disease please sign the blank below.

Believing in health and cleanliness, and intending to do my share in the health campaign, I wish to become a member of the Dorchester Community Sanitation League, and I agree to have my premises made as sanitary as possible.

Sign here, and if not called for in three days mail to Mrs. James B. Noble, secretary of the Dorchester Community Sanitation League, Cambridge, Md.

______________________________.

About the middle of October a folder post card bearing the following was mailed to every member of the league:

Dorchester Community Sanitation League,
Cambridge, Md., October 20, 1914.

Dear Madam: As a member of the Dorchester Community Sanitation League, which was organized in the interest of better health conditions throughout the town and county, every woman entering her name for membership has no dues to pay, but pledges herself to cooperate with the Government health officials, who have been here since about July 15, and with the local board, by changing the present open, unsafe closet into a closed one, using only the water-tight can or bucket under the closet seat, and covering the holes with heavy lids, held in place by spring hinges. The cost will be only the price of the can and few extra boards used in making the box under the seat flyproof, with 5 or 10 cents for spring hinges. Don't wait for a carpenter, because the work can be done by anyone within an hour or two. Use lime in the can freely.

When the can needs emptying, take it down the hill from your well or spring, dig a hole, use lime in it, and bury the contents of can. A closet made and cared for like this is known as type "A," and is the one meeting Government approval. We hope to soon have every closet in the county of this type. Please fill out the attached post card, put a 1-cent stamp on it, and let us know if your closet is in proper condition.

Sincerely, yours,
Dorchester Community Sanitation League.

The detachable reply card bore the following:

November ______, 1914.
By November ______, 1914, my closet will be made "A" type.
Name______________________________,
P. O.___________________________,
Maryland.

The following was delivered to the proprietors of stores in which foods were sold in Cambridge:

Dorchester Community Sanitation League,
Cambridge, Md.

To the proprietor.

Dear Sir: Your careful consideration of this letter is asked by the Dorchester Community Sanitation League. A copy of it is being sent to every store in Cambridge that handles foodstuffs of any kind.

In the nation-wide campaign for the suppression of preventable diseases, the common house fly has been found to be the chief foe of health, as he is the chief spreader of the diseases. Everywhere experts are trying to use every possible means to exterminate this fly. To this end we ask your active cooperation. The people who buy food from you have a right to all the protection you can give them. The league suggests the following ways in which you can help to rid our community of its two most terrible scourges—tuberculosis and typhoid fever:

Keep flies out of the store as far as possible by adequate screening of all doors and windows and the use of a fly trap outside, but especially protect food that is eaten without cooking. All such food should be carefully covered from flies and dust.

Do not use the hands for handling any food for which a scoop can be used. This simple precaution is especially important in the handling of candy, which so often goes immediately into a little child's mouth.

When milk or milk products are sold, double care is needed, as milk is the favorite soil of many germs, and in it they multiply with great rapidity. Ice cream needs all the precautions taken with milk, freezing in no way lessening the danger.

Respectfully,

D. C. S. L. Executive Committee.

The committee will be glad to receive information or suggestions from any person.

Under the auspices of the community league a negro woman's branch of the organization was formed in Cambridge which was instrumental in getting sanitary improvements made in the ward of the city occupied almost exclusively by colored people.

In the summer of 1915, nearly a year subsequent to the sanitary survey, the league in fostering a clean-up week for Cambridge circularized the members of the Cambridge branch with the following:

Dorchester Community Sanitation League,
Cambridge, Md.

Dear Madam: By means of this letter the Dorchester Community Sanitation League wishes to remind you of the necessity of continuing the watchful care over your premises that you promised last year when you became a member of the league. Inclosed with this you will find some printed matter that we hope will interest you. The early start we are now making is expected to get the town in much better sanitary condition than was possible last year, but to do so every woman must do her part as she obligated to do. The league asks three things of you, simple but very important:

(1) If there is an outdoor toilet on your premises that has not been sanitated—that, is, made fly proof—will you not have it attended to at once?

(2) Will you not help the league and the board of trade make clean-up week a great success?

(3) Will you not only kill every fly possible, but endeavor to prevent them finding breeding places on your property, and, if possible, keep a well-baited flytrap in your back yard?

If every housekeeper will do these three things we will soon have a perfectly clean Cambridge.

Yours, for sanitation and health,

D. C. S. L. Executive Committee.

The committee will be glad to receive information or suggestions from any person.

The inclosure referred to was a printed slip bearing the following statement:

This is what the sanitary survey has done for Cambridge and Dorchester County:

Typhoid cases in Cambridge:	
First 8 months 1913	21
First 8 months 1914	13
Last 4 months 1913	39
Last 4 months 1914	18
A reduction for the last 4 months of 1914 of 53 per cent.	
Typhoid cases in Dorchester County:	
First 8 months 1913	71
First 8 months 1914	77
An increase of 8 per cent.	
Last 4 months 1913	115
Last 4 months 1914	51
A decrease of 55 per cent for the last 4 months of 1914.	

RESULTS

Country homes.—Immediately following the first round of survey, which was completed in about six weeks, a revisit was made to 1,627 representative country homes in different sections of the county to ascertain what impression the educational work had made upon the minds of the people. The findings on this round of revisits were encouraging. At a majority of the homes some sanitary improvement of greater or less degree had been made. At 92, or 5.6 per cent, of the 1,627 homes which on the first round of survey were found to have either grossly insanitary privies or no toilets of any kind, high-grade ("A" type) sanitary privies had been installed. This work had been done in the busiest period of the trucking and farming season. At 716 of the homes it was definitely stated by the head of the household that a sanitary privy would be installed within a period of 60 days, or as soon as the material and labor for construction could be obtained. Three weeks subsequent to the first follow-up visit 500 of these 716 homes were again visited. On this second round of visits it was found that at 111, or 22 per cent, "A" type sanitary privies had been completed, and at 25. or 5 per cent, the privies had been provided with water-tight receptacles and had been markedly improved in construction, though not made strictly fly proof, and were graded as " B " type.

In the latter part of October and the early part of November a third and final round of follow-up visits were made with a view of determining the degree of sanitary improvements accomplished at country homes for the county as a whole. Ten different representative neighborhoods in widely separated parts of the county were selected for this purpose. Thirty homes, regarded as typical, were visited in each of these neighborhoods. Of the aggregate 300 homes so visited, 51, or 17 per cent, had "A" type sanitary privies; 33, or 11 per cent, had " B " type privies; and 8, or 2.6 per cent, had " C " type privies. Thus, it is estimated that as a result of the educational phase of the sanitary survey marked improvement in construction of privies and tremendous advance in cleanliness of methods in disposal of human excreta had been made at over 30 per cent of all the country homes in the county. The 17 per cent of homes with high-grade sanitary privies furnished a demonstration apparently worth while. Besides improvements in excreta disposal, general cleanliness had advanced at a large majority of the homes, and at about 8 per cent more or less radical improvement had been made in water supplies. If the demonstration plan of work evolved from the three years' field experience and carried out in Mason County, Ky., and in a number of the extra cantonment areas in 1917 had been undertaken in Dorchester County, the writer has not a doubt that a remarkable result could have been accomplishel in the strictly rural sections of Dorchester County.

Schools.—The superintendent of county schools recommended the installation of sanitary privies at all the rural schools. The school supervisors authorized the expenditure of the money to have the work done. But the local trustees of schools whose duty it was to execute such work at the schools were dilatory, and the end of the survey little had been done, sanitary privies having been installed at only one of the rural schools.

Dairies.—At three of the dairies in the county high-grade sanitary improvements—including installation of sanitary privies—were made. At most of the other dairies sanitary improvements were promised.

Towns.—In each of the five towns the town council made an appropriation for the labor, equipment, and disinfectant needed for a cleaning of all privies. The work was performed under the direction of the sanitary survey force.

In Cambridge all of the 1,575 privies were cleaned and disinfected. From them 5,357 bushels of matter were treated with disinfectant, placed in water-eight covered cans, hauled to fields outside the city, and plowed under in a sanitary manner. The cost of the work to the city was $417.89, or a rate of 8.7 cents per bushel of matter removed. Previous to this demonstration in sanitary disposal of privy contents the scavenging of the privies was unsystematic and faulty. The scavenger hauled the matter in an open cart to the edge of the town and dumped it on the surface of the ground, where it served as a breeding place for flies and was a menace to the health of the city. In the other four towns, Hurlock, East New Market, Vienna, and Secretary, a clean-up of all privies was accomplished on the same plan as that carried out in Cambridge. Following the clean-up work the town councils of Cambridge and Hurlock passed ordinances providing for adequate scavenger service and requiring that all privies be of sanitary type.

The clean-up work in the towns was begun August 1 and completed about September 15. As it went on the citizens were encouraged to abolish privies wherever water-closets with sewer connection could be installed in their stead, and where privies had to be continued in use to make them of sanitary type.

The following table presents the extent of the work and some of its immediate results:

	Cambridge.		East New Market.		Hurlock.		Vienna.		Secretary.	
Bushels of excreta removed		5,357		252		324		1,980		1,500
Number of privies		1,575		82		119		91		87
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Privies made, A type	505	31.43	26	31.70	51	42.85	20	21.98	8	9.19
Privies made, B type	542	35.05	55	67.08	41	34.45	15	16.48	25	28.73
Privies abolished	214	13.58	......	......	......	......	......	......	......	......
No improvement in privy construction	314	19.93	1	1.22	27	22.69	56	61.54	54	62.07

Thus by the time the survey was terminated on November 15, of the 1,954 privies in the towns, 610, or 31.22 per cent, were of "A" type and 214, or 10.95 per cent, had been abolished with water-closets installed in their stead (figs. 30–32).

Typhoid fever reduction.—In the period of four months—September, October, November, and December, of 1913, the year before the survey—there were reported in the county 115 cases of and 20 deaths from typhoid fever. In the corresponding period of 1914, the year of the survey, there were reported in the county only 51 cases of and 3 deaths from typhoid fever (chart 8). That this reduction resulted largely form the sanitary work is indicated by the returns from the other Eastern Shore counties of Maryland. The comparison is presented in the following tables:

Cases of typhoid fever reported Sept. 1 to Dec. 31.

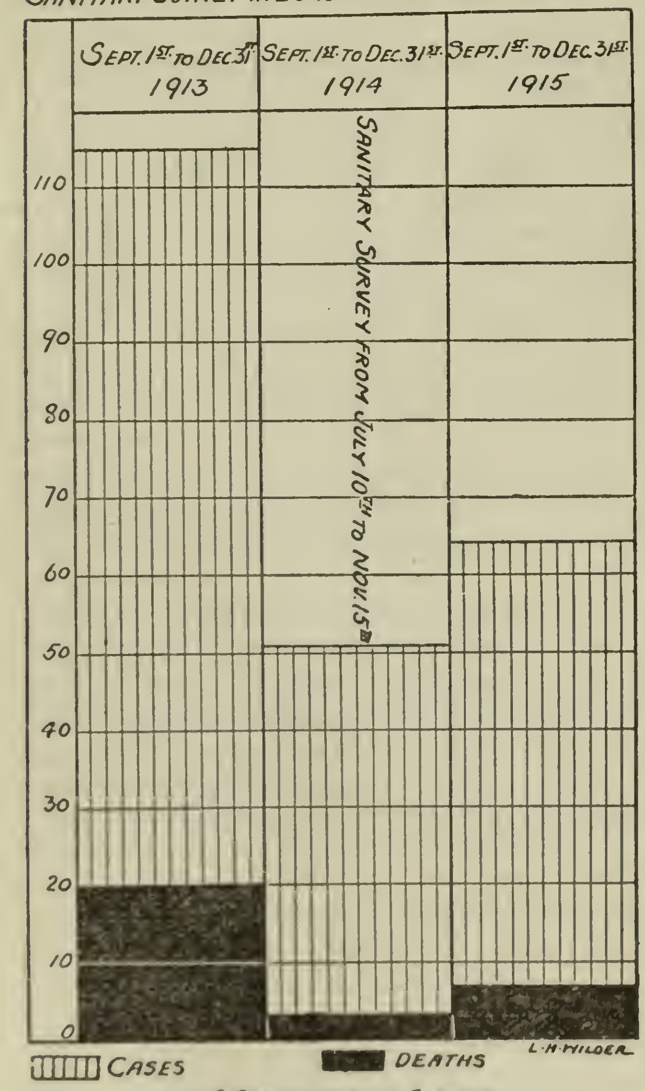
County.	1913	1914
Talbot	23	39
Caroline	33	23
Wicomico	36	31
Worcester	15	48
Kent	22	17
Queen Annes	63	44
Somerset	52	44
Dorchester	115	51
Total for all except Dorchester	244	246

Deaths from typhoid fever reported Sept. 1 to Dec. 31.

County.	1913	1914
Talbot	5	5
Caroline	3	
Wicomico	12	4
Worcester	7	5
Kent	5	1
Queen Annes	14	3
Somerset	8	5
Dorchester	20	3
Total for all except Dorchester	54	23

In Dorchester County the typhoid fever death rate per 100,000 population in 1915, the year subsequent to that of the survey, was 62, as against a rate of 101 for 1913, the year before that of the survey. Thus it appears that a demonstration in the feasibility of reducing typhoid fever by the popularization of sanitary measures in rural districts was accomplished in this county.

CHART 8:- TYPHOID FEVER REDUCTION FOLLOWING SANITARY SURVEY IN DORCHESTER COUNTY, MD.



U.S. PUBLIC HEALTH SERVICE

RESURVEY IN 1916.

In the fall of 1916 Assistant Epidemiologist F. E. Harrington visited Dorchester County, and, in company with the deputy State health officer for the ninth sanitary district of the State, made a quick resurvey of the towns and of several sample county neighborhoods. The results of these observations were reported as follows:

"Cambridge, the county seat, was found to have made extensions to its sewer system, having made 300 additional connections to properties, and having caused to be abandoned and removed about 500 insanitary privies, 200 of which had existed on properties already sewered. The sewer extension is being continued. There are now about 1,000 unsewered homes with 100 insanitary privies; the remainder (900) are provided with water-tight receptacles, but many of them are not strictly fly proof. The proper maintenance of a scavenger service seems to be the obstacle, and recommendations were made for improving this condition. Assurance was given that the recommendations would be adopted.

"The water supply for the town has been extended, and will be further extended as rapidly as possible. General cleanliness of the town was on a higher scale than formerly, and continued improvement may reasonably be expected.

"East New Market, a small town, has installed a central water supply, and two-thirds of the town has privies equipped with water-tight, though not strictly fly-proof, receptacles. Some cesspools are still in use, but at several homes septic tanks with superficial soil distribution of effluent were being, or recently had been, constructed.

"There was no public scavenger system, the householders depending upon privy cleaners whom they hire to do the work. Recommendations were made to the authorities of the town, and it is reasonable to believe that an improvement in privy construction and in the methods of scavenging will follow.

"*Hurlock.*—In this town a more dependable scavenger service was found. Fifty per cent of the homes had privies provided with water-tight receptacles. There were a few, about 20, privies found to be fly proof, in addition to the water-tight receptacles. Some septic tanks, as in East New Market, had been built, and some cesspools were still in use. Though without sewers, the town had extended its water system, and additional extensions are contemplated.

"*Vienna.*—In this town a retrogression was found. In the absence of any scavenger system, the bucket privy had proven unsatisfactory, and as no system of scavenging was instituted, practically all buckets were removed from the privies that had, following the survey, been installed. An effort will be made to establish a municipal scavenger service, and to have the privies improved again.

"Some of the schoolhouses in the county have recently installed the pail system of privy, but none have been made fly proof. At the canneries and oyster-shucking places, the privies were found generally to be in good condition. Most of these privies were of the 'A' type and well cared for.

"Throughout the county generally at rural homes a small percentage of improvement subsequent to 1914 was found. At homes in which typhoid fever has occurred the State laws require the construction of a sanitary privy, and this work has been done at many of these homes."

FOREWORD ON WORK IN 1915.

The findings and the results obtained from the surveys made in 1914 appeared to justify an extension of the operations.

In the spring of 1915 surveys were begun in five counties, viz, Anne Arundel County, Md.; Orange County, N. C.; Walker County, Ala.; Wilson County, Kans.; and Dallas County, Iowa. As in 1914, Surg. L. L. Lumsden was in general charge of the work and visited the different counties from time to time to confer with the officers in immediate charge, and to assist in the detailed operations. The officers in immediate charge of the county units were as follows: Asst. Surg. J. B. Laughlin in Anne Arundel, Assistant Epidemiologist F. E. Harrington in Orange, Asst. Surg. R. E. Wynne in Walker, Asst. Surg. H. C. Yarbrough in Wilson, and Asst. Surg. K. E. Miller in Dallas County. An important addition to the force in 1915 was Epidemiologist A. W. Freeman, who, as assistant commissioner of health of the State had had an extensive experience in rural sanitation work in Virginia. Dr. Freeman served in an advisory capacity to the officers in immediate charge of the work in Wilson and Dallas Counties, dividing his time about equally between the two counties. By this arrangement, Surg. Lumsden was enabled to devote most of his time to the other three counties.

The plan of work in 1915 was generally similar to that in 1914, but certain improvements in methods, learned from experience in the previous year, were carried out. Among these improvements, the sending out of a circular letter (see p. 24), signed by the Surgeon General of the Public Health Service and indorsed by the State health officer, to all families in the county, before the survey was begun, and the wearing of a distinctive uniform by the men engaged in making the survey proved particularly advantageous. Another innovation was the use by the field men of privy models to demonstrate in detail, in the course of their house-to-house visits, how an insanitary privy can be converted into a privy of sanitary type.

Following the success of the work in 1914, a large number of requests for county surveys were received from State and local officials. Therefore, opportunity was afforded for the exercise of considerable discrimination in the selection of counties for the work in 1915 and 1916. Besides the general considerations from an investigative standpoint, the extent of cooperation offered by State and county health departments and by local civic organizations was a factor in determining what counties should be selected for the survey.

SANITARY SURVEY OF ANNE ARUNDEL COUNTY, MD.

The rule contemplated was to extend the survey to only one county in a State. Maryland, however, presented an exceptional situation. Chesapeake Bay divides the State into two widely separated sections. The general conditions in these two sections are quite dissimilar. The State board of health had furnished over half of the working force for the survey of Dorchester County in 1914 and offered to furnish half of the working force for a survey of a "western shore" county in 1915. Anne Arundel County, on the west shore of Chesapeake Bay, was selected. The survey of this county was begun on April 21, 1915, and terminated on October 1, 1915.

GENERAL CONDITIONS.

Anne Arundel County lies between the thirty-eighth and fortieth parallels of latitude and the seventy-sixth and seventy-seventh meridians of longitude. The county has a population of 39,553, according to the census of 1910, and a land area of 439 square miles. It is essentially an agricultural county, 90 per cent of the population being rural. The contour of the land is rolling, and the soil is for the most part a sandy loam, well suited for farming. The soil is very porous, consisting for the greater part of sand and sandy loam, with little clay. Storm waters do not remain on the surface but for a short time, being quickly taken up by the soil, except in the low-lying lands, whose surface has been rendered less pervious by clogging with silt carried over by previous rains, or where streams, swollen by sudden downpours, have left their usual confines and flooded the adjacent territory.

Various kinds of truck and fruit, together with tobacco, constitute the principal crops, although some grain and hay are raised. Of the farms, 1,369 are operated by owners and 601 by tenants. In those portions of the county adjacent to Chesapeake Bay, fishing in summer and oystering in winter are important industries.

The population is for the most part native born, the foreign element constituting only 15 per cent of the total population, and, although scattered throughout the county, are most numerous in the "South Baltimore" region. The Negro population is about 32 per cent of the whole. The number of foreigners and negroes is augmented considerably during the "picking" season, which lasts from May until September, as large numbers of laborers are brought from Baltimore to work in the fields. Some labor is imported, also, for work in the canneries, but as there are only about half a dozen small canneries, the number brought in for this purpose is not large.

The itinerant laborers at both the canneries and the truck farms live under very unhygienic conditions. They are herded together in shacks. In one instance thirty-odd people (colored) of both sexes occupied a room 25 by 50 feet, no other house being provided for their habitation. Cooking is done at outdoor ovens. Nothing is screened, and flies swarm over foods and filth. What privies there are are of "E" type. They are generally dilapidated and foul and in many instances afforded practically no privacy. Some of the laborers use them; most do not, but resort to any convenient clump of bushes. The water supplies of the "picking" camps are, for the most part, bad, being shallow dug wells, with no protection against pollution. Not only are the conditions under which these people live bad for them, but they are a menace to the health of the neighborhood in which the pickers are quartered. The owners of the property generally appear amenable to suggestions about sanitary improvements, but say that it is a waste of money to provide sanitary arrangements at the camps, as the workers will not use them. Such a view, in the opinion of the writer, is based on an underestimate of the natural tendency to human decency.

Owing to the beautiful rivers, as well as to its nearness to Baltimore and Washington, a large number of summer homes have been built in the county. In several instances, colonies of 30 to 40 houses have been established. In addition to these homes of the better class, a considerable number, 150 to 200, of so-called "shore shacks" are to be found along the creeks in the neighborhood of South Baltimore. These for the most part consist of one or two rooms, and are seldom occupied except on Sundays. The sanitary arrangements and the water supplies at the regular summer homes are generally good. Most of the "shore shacks" have very poor sanitary arrangements, the toilet accommodations being "E" and "D" type privies, and the source of water supply being shallow dug wells, varying in depth from 10 to 20 feet.

There are only two incorporated towns in the county, Annapolis, the county seat, with a population of about 9,000, and Arundel on the Bay, a summer colony of about 17 homes.

PLAN AND SCOPE OF SANITARY SURVEY.

The work comprised (1) a canvass and sanitary survey of all the rural homes in the county; (2) a general survey of the city of Annapolis; (3) a sanitary survey of schools, churches, railway stations, post offices, and stores in the rural districts; (4) public addresses on the subject of sanitation, with lantern-slide illustrations, in all sections of the county; (5) distribution of literature on different phases of the subject of sanitation; (6) the epidemiological investigation of cases of typhoid fever as they developed; and (7) a special study of conditions affecting the prevalence of malaria in the county.

The men engaged in making the survey consisted in about equal proportions of trained officers of the Public Health Service and officers—some trained and some untrained—of the State board of health. The number ranged from a maximum of 12 to a minimum of 5, and averaged 7 for the whole period of the survey.

Headquarters were established in offices in the post-office building in Annapolis.

The inspectors were fortunate in obtaining good road maps of the county, thus making it comparatively easy to find and visit every house. The men lived in the country and worked in pairs—one pair being assigned to duty in each of the five (voting) districts which constitute the political divisions of the county. Buggies and automobiles were used in visiting the homes. The latter proved the more advantageous on account of the good condition of the roads.

Data were secured at each home visited, the premises were inspected, and advice was given as to how the well and privy could be made sanitary. The story of typhoid and allied diseases was told, and the means whereby they could be prevented explained. Literature bearing on the subject was left with the family. All told, about 15,000 bulletins were distributed.

In addition to the talks at the homes 42 illustrated lectures were given in the county. These lectures were attended by 2,100 people. They were held in schools and churches and no two were held in the same place. The meetings lasted usually about an hour and a half, and at the close the audience was requested to ask any questions that might occur to them, the meeting being thrown open for discussion. The largest number present at any one meeting was 350, the lowest number 25, the average being 50.

The public meeting appeared to serve a very useful purpose in this county. It enabled the people who were not at home when the inspectors called to hear the facts of sanitation explained in detailed. At the end of the lecture, as a rule, intelligent questions raised in the minds of the people from a reading of the literature left at their homes would be asked by the audience.

Asst. Surg. R. C. Derivaux, an officer of the Public Health Service, who had had special training in malaria work, was detailed to the force to make a study of conditions affecting the prevalence of malaria in the county. His studies were begun in the early part of June and continued until October 1. A report of his findings is given on p. 111.

All homes from which typhoid cases were reported were visited and bedside prophylaxis explained. In the course of these visits antityphoid inoculation was offered and in practically every instance administered by the district health officer.

On August 1 letters were addressed to all the homes that had been visited, reminding the people that the height of the typhoid season was at hand and advising them to carry out the instructions that had been given them relative to typhoid prevention. Questions which needed clearing up were solicited, and an invitation extended to the citizens of the county to come in person to the office in the post-office building at Annapolis and have anything that they did not understand about the work explained. These letters were signed by the officer in charge of the work and by the district health officer.

FINDINGS IN RURAL SECTIONS.

Of the 7,543 dwellings visited in the rural sections 607 were vacant, and at 377 there was no one at home, leaving 6,559 homes for which full data were obtained.

Popular attitude toward the work.—At only 7 (or 0.1 per cent) of the homes visited did the investigators fail to meet with a cordial reception. The citizens generally seemed anxious to cooperate in the study, and to obtain suggestions about needed corrections of insanitary conditions at their homes.

Race.—At 73.5 per cent of the homes the families were white, and at 26.5 per cent the families were colored.

Nationality of families.—This applies to the place of birth of the head of the family. Of 6,544 homes at which this information was elicited the head of the household was American at 5,882, English at 8, German at 273, Austrian at 39, Polish at 194, Swedish at 6, Norwegian at 7, Danish at 7, Russian at 30, Bohemian at 74, French at 2, Italian at 6, Irish at 8, Lithuanian at 6, Chinese at 1, and Belgian at 1.

Number in household.—The number of persons in 6,559 homes at which the number in the household was enumerated was 30,666. Thus the average for each home in the rural section of the county was 4.7.

Age and sex.—Of the 30,666 persons enumerated in the homes canvassed, 8,585 were children under 10 years of age, 6,572 were persons between 10 and 20, and 15,509 were over 20. Fifteen thousand five hundred and sixty-seven were male and 15,099 were female.

Sale of foods.—From 1,524 of the homes canvassed foods (such as are usually eaten uncooked) were sold more or less regularly; from 587 milk only was sold, from 178 vegetables only, from 81 fruits only, from 32 milk, vegetables, and fruits; from 17 milk and vegetables; from 3 milk and fruits; from 601 fruits and vegetables; and from 25 oysters. These foods were sold principally to the Baltimore markets, but some went to Washington, Philadelphia, New York, and other cities in other States.

Number of rooms to house:	Dwellings.
With 1 room	91
With 2 rooms	524
With 3 rooms	732
With 4 rooms	1,361
With 5 rooms	1,789
With 6 rooms	1,291
With 7 rooms	536
With 8 rooms	536
With 9 rooms	251
With 10 rooms	180
With 11 rooms	50
With 12 rooms	90
Over 12 rooms	112
Total	7,543

General appearance of residence.—For 3,257 recorded as good, for 2,063 as fair, for 2,089 as poor, while for 134 homes this information was not recorded.

Construction of house:	
Frame	6,747
Brick	556
Stone	40
Cement	1
Not recorded	199
Total	7,543

General cleanliness.—Recorded as good for 3,135 homes, fair for 2,250, poor for 1,484 homes, and was not stated for 674 homes.

Cellars.—One thousand nine hundred and seventy-seven of the country homes had cellars, while 5,566 had none.

Screening in summer.—At 3,127 homes the screening of dining room and kitchen was complete, at 1,431 the screening of dining room and kitchen was incomplete and served as a means to exclude probably 50 per cent of the flies seeking admission; at 1,798, or 28 per cent, of the homes there was no screening of dining room or kitchen, and at 1,187 of the homes the presence or absence of screening was not recorded.

Topography.—Three thousand four hundred and forty-eight of the homes were on rolling ground, 1,069 on hilly ground, 2,944 on flat ground, and for 82 the topography was not recorded.

Animals on premises.—At 1,785 of the country homes cows were kept, at 3,090 homes horses or mules were kept, at 2,731 homes hogs were kept, at 3,428 homes dogs were kept, at 3,001 homes cats were kept.

Stable manure.—Of all the rural homes in the county at which animals were stabled, at only 160 was provision made to protect stable manure so as to prevent it to a fair degree from becoming a breeding place for flies.

Disposal of human excreta.—Three hundred and seventy-three homes had water-closets, 5,555 had privies, 722 (or 10.85 per cent) had neither water-closets nor privies, and for 893 this information was not recorded.

Of the 373 water-closets, 200 emptied into cesspools, 70 into septic tanks, and 103 emptied directly into the bay or streams.

Of the 5,555 privies in the rural districts of the county, 203 were sanitary "A" type privies, with fly-proof boxes and water-tight receptacles; 368 were fair "B" type privies, with water-tight vessels, but unprotected from flies; 465 privies were screened against flies, but without the receptacle necessary to prevent pollution of the soil ("C" type); 2,309 were privies having neither screens nor vessels, but boarded up in the back to prevent the access of barnyard animals to the filth ("D" type); and 2,029 were the grossly insanitary open-back "E" type privies. For 181 insanitary privies the type is not recorded.

The distance of the privy from the kitchen at the different homes was as follows: For 1,846 homes less than 50 feet, for 2,198 homes between 50 and 100 feet, for 844 homes over 100 feet, and for 667 homes having privies this information is not recorded.

Of the 5,555 homes having privies, the privies were used, according to the statements obtained, at 4,246 homes by all members of the family, at 36 homes by men only, at 46 homes by women only, at 147 homes by men and women, at 78 homes by women and children only, at 2 homes by men and children only. For 1,000 homes information on this point was not recorded.

At 2,029 homes chickens and other domestic animals had access to the privy contents, and freely scattered the matter about the premises. According to the surface indications, privy contents were liable to get into the water supply in 10 instances, into the yard in 347 instances; into truck patch in 88 instances, into fruit grounds in 126 instances, and into all of these in 1,999 instances. For the spreading of the filth, drainage was responsible at 602 dwellings, and carriers at 1,968 dwellings.

At 597 homes the disposal of the privy contents was by scattering the filth, at 2,379 by burial, at 4 by burning, at 121 by dumping into river or bay, and for 2,454 homes the method of disposal was not recorded.

Water supply.—Water for drinking and culinary purposes was obtained from wells at 3,968 of the homes, from springs at 1,439, and from cisterns at 15 homes. Two thousand homes had no water supply on the premises, and for 121 homes no information was recorded on this subject.

At 2,625 (or 48.41 per cent) of the homes having water supply on premises, the source of the water supply was apparently exposed to pollution with human excreta or other refuse matter, and was regarded by the inspector as unsafe. In striking contrast to the opinion of the investigator in respect to safety of water supplies in use, was the opinion of the responsible members of the household canvassed. Definite statements of opinion on the character of the water supply were obtained from the father or mother or some other responsible member of the household at 4,564 homes. At 4,429 of these the water supply in use at the home was regarded by the members of the household as being safe, and at only 135 was the water supply regarded by the users as either unsafe or questionable.

At 820 of the homes the source of water supply was downhill from and obviously exposed to surface drainage from insanitary open privies or from stable, or from both.

Of the 3,968 wells, 2,581 were dug, 633 were driven or bored, and for 754 information as to the character of the well was not recorded. Six hundred and thirty-three wells had an iron casing to prevent subsurface seepage. 83

had casings of cement, 2,492 were cased with brick, 55 with pipe, 193 with wood, 134 with stone, and for 378 kind of casing was not recorded.

Four wells were less than 10 feet distant from privies, 173 were between 10 and 25 feet distant, 1,412 between 25 and 50 feet distant, 1,294 between 50 and 100 feet distant, 671 over 100 feet distant from the nearest privy. For 414 wells the distance was not recorded.

Seventy-one of the wells were less than 10 feet deep, 681 between 10 and 20 feet deep, 1,556 between 20 and 50 feet deep, 582 between 50 and 100 feet deep, and 180 between 100 and 200 feet deep, and 30 over 200 feet deep. The depth of 868 wells was not recorded.

Two thousand four hundred and twenty-seven wells were provided with pumps and 811 wells had buckets. For 730 the means for lifting the water was not rcorded. One thousand three hundred and eighty-eight wells had tight plat- 698 of cement, 576 of brick, and 50 of stone. For 230 wells with curbing the forms. For 2,580 the character of the platform was not recorded. Two thousand five hundred and eighty-one wells had curbings to prevent surface drainage into the well; 1,387 had none. Of these curbings, 1,027 were of wood, character of the curbing was not recorded.

Of the 1,439 springs, 310 were down slope from the privy, and 200 were down slope from the stable. Four of the springs were within 25 feet of the privy, 100 between 25 and 50 feet distant, 203 between 50 and 100 feet, and 1,032 over 100 feet distant from the privy. For 100 springs the distance was not recorded.

Three hundred and forty-two springs were curbed, 179 were walled up, 75 were piped, and 93 were ditched to prevent the drainage of surface water into the spring.

Fourteen of the fifteen cisterns found were water-tight, one was not. Fourteen cisterns had a protected top, one had not. One cistern was so located that drainage was toward it from outhouses on the premises.

Unincorporated towns.—Three densely populated settlements in the county are designated Eastport, Germantown, and South Baltimore.

Eastport, with a population of approximately 2,000, is situated on the opposite side of Spa Creek from Annapolis. The town is connected with Annapolis by means of a bridge, and is surrounded on three sides by water. Eastport is a residential community. Most of the adult inhabitants work in Annapolis or engage in fishing or oystering. The land is flat and the soil is sandy. The village is congested, the houses being built close together except in the southwestern portion. The streets are unpaved, and there are only a few paved sidewalks. There is no public water supply or sewerage system, shallow wells and surface privies serving instead. A few of the homes have cesspools, and a few have flush toilets with sewer pipes running into the river. The house lots are small, and, in consequence, the wells and privies are separated by only a few feet, 50 at the greatest, the majority being only 25 to 40 feet apart. Because of the proximity of the wells and privies and the sandy nature of the soil it can readily be seen that there is every chance for well pollution. Analyses, made in the laboratory of the State department of health, of water from 12 or 15 wells taken at random throughout the village, showed heavy pollution, colon bacilli being found in every instance. From the conditions obtaining it is clearly evident that Eastport is likely to be visited by a serious epidemic of typhoid at any time. According to the morbidity figures of the State department of health there were in the town in 1910 22 reported cases of typhoid fever, and in the following year 8. In 1912, 1913, and 1914, however, Eastport was rather singularly free from typhoid. The comparative freedom from this disease in the last three years may be due largely to the community immunization from fairly constant dosage with infection. Tentatitve plans to have the Annapolis water supply extended to Eastport, and for a disposal plant to take care of the combined sewage of Annapolis and Eastport were under consideration at the close of the survey.

Germantown is an unincorporated settlement situated at the western boundary of Annapolis. It is contiguous with and for all practical purposes is a part of the city. The population is between five and six hundred. The houses are built close together. The water supply for most of the homes is obtained from the Annapolis supply, the mains of which extend through the village. With the exception of 15 or 18 houses having flush toilets which empty into cesspools, all of the homes have surface privies of the pit type. Most of the privy pits were found to be overflowing and very filthy. About one dozen wells were found in use. A bacteriological examination of three of them revealed gross pollution. From the sandy nature of the soil and the apparent chance for pollution there is every reason to believe that all the wells in the town were in the same condition. Early in April waste water from wash basins and bathtubs was allowed to run in the streets, and in one instance a cesspool was found to be overflowing into a street gutter. These conditions were remedied during the summer. It was expected that eventually the sewage from Germantown would be taken care of in the general sewerage system of Annapolis and vicinity.

The region of South Baltimore, which includes the villages of Brooklyn, Curtis Bay, Fairfield, and Masonville, may be considered as one community. It is a suburb of Baltimore, being connected with that city by trolley cars. The population is about 5,000. Of the four settlements making up "South Baltimore" Brooklyn and Curtis Bay are the largest and most congested. The area of "South Baltimore" is 1½ square miles. There is a number of factories in this community. The B. & O. Railroad yards are also situated here. Most of the adult inhabitants of the several towns are employed in the various local plants. About one-half of the population are foreigners, east Europeans being in the majority. This fact caused considerable difficulty to the inspectors when visiting the homes, because of the multiplicity of languages spoken. The drinking water for the most part is furnished from a public piped supply owned by a land-development company, and obtained from deep wells. At Wagner's Point the employees of the asphalt works get their water supply from a deep well owned by the asphalt company. At a considerable proportion of the homes water from private wells is used. There is no public sewerage system, practically all of the homes having privies of the vault type. These privies were not cleaned with any degree of regularity and many of them were overflowing. It was not possible to learn definitely what was done with the privy contents removed, but it is understood that it was hauled away and used as fertilizer. There are a few paved streets in both Brooklyn and Curtis Bay, but surface water was allowed to run in open drains through the streets. The alleys were dirty, and pools of water in them were numerous.

Camps.—A Salvation Army camp, accommodating about 85 women and children, and occupied throughout the summer, was inspected. The camp consisted of a frame building and two tents. The building was in a fair state of repair, but the grounds and the interior of the building were very dirty. Water was obtained from a spring 200 yards away, which from surface indications was good. An "E" type privy overhanging a small stream served the camp. The officer in charge appeared to be much interested in sanitation and stated that an "A" type privy would be installed for the camp before the following summer.

A camp operated throughout the summer by the Baltimore Home for the Friendless was also inspected. At this "camp" 150 children were domiciled in a good 12-room house, which was found in excellent condition. The grounds were clean and well kept. Water was obtained from a well on a neighboring farm, and was of questionable wholesomeness. The lady in charge was advised to boil the water before it was used, and she stated she would do so. One "E" type privy served the camp. While there was no evidence of soil pollution in the grounds, there was such indication in some woods 200 yards away. It appeared that many of the children frequented the woods instead of the privy to void their excretions. The privy was cleaned out once a week and the material buried. The superintendent of this camp also promised to have an "A" type privy installed before the next season.

The Baltimore Y. M. C. A. camp had a latrine about 12 feet deep. Over this was a frame seat having four openings with covers. Upon recommendation of the investigators, the director of the camp screened the frame with fly wire, making the latrine a "C" type privy. Lime was freely used in this trench, and in the evening earth was shoveled over the excreta. The camp obtained its drinking water from a polluted well on a neighboring farm, but this was discontinued upon the advice of the investigators, and water was brought from a flowing well one-half mile away. The Washington Y. M. C. A. camp also got its water from a bad well, but stopped this after the visit of the investigators, thereafter getting water from the flowing well mentioned above. The privy at this camp was in very bad condition. It was a "C" type, and although chloride of lime was used freely, it was very foul. The director at this camp had the privy cleaned and promised to have an "A" privy installed by the next season. Both camps were well policed, and there was a marked freedom from flies. The boys were shown how to make large fly traps, and several of these were installed at the Baltimore camp. The occupants of these two Y. M. C. A. camps lived in good tents having wooden floors and slept under mosquito bars.

Schools.—Definite data regarding water supplies and excreta disposal for 18 of the 59 schools in the county were recorded. Of these 18 schools, 9 were found to be in good repair, 6 were in fair shape, while 3 were in bad condition. None of the schools were screened. Six had wells on the premises, and one obtained its drinking water from a spring in the school yard. One of the wells was drilled and was 100 feet in depth. The other wells were of the shallow dug type, and were from 15 to 20 feet in depth. Seventeen of the schools had privies, one did not. These privies were as follows: Two can privies, unscreened, preventing soil pollution and the access of animals, but not screened against flies; 1 screened privy without receptacle, permitting soil pollution; seven privies unscreened and with no receptacle, but boarded up against animals; seven grossly insanitary, unprotected open-back privies. None of the 17 privies was kept in a sanitary manner. The district health officer was making a systematic and thorough inspection of the rural schools, including physical examination of the school children.

Churches.—Twenty-three rural churches were inspected during the survey, with the following findings: Ten were in good repair, 3 were in fair condition, while the others were very poor. Five of the churches had water supplies on the grounds. These were shallow dug wells. Eleven churches had privies, none of these being sanitary. In six of them some attempt was made to keep out barnyard animals.

Stores.—Ninety-four country stores were inspected during the survey of the county. At 48 eatable goods were screened from flies, and the general cleanliness was good. At 32 of the stores evidence of spitting on the floor was noticed, and at practically none of the stores were toilets provided.

Post offices.—Seven rural post offices located in as many country stores were inspected. Two of these stores were fairly clean. The other five were dirty. The floors were soiled with sputum, and no spittoons were provided for the use of customers. At none was there a sanitary toilet.

Dairies.—The milk supply at Annapolis is derived from 23 dairies located within a radius of 5 miles of the city. The sanitary conditions and the methods of handling the milk at the dairies generally were found far from satisfactory. The veterinarian of the State department of health visits the dairies at least once a year. As a result of his inspection the dairies in the vicinity of Annapolis are being improved, and it appears probable that in a few years the quality of milk furnished Annapolis will be good. In 1914 very few of the dairies kept their milking utensils under screens; in 1915 all but five were doing so. Manure was no longer allowed to collect near the barns, and there was a general improvement in cleanliness of the barns. The water supply used at most of the dairies was exposed to pollution, and of all the 23 dairies supplying Annapolis only 1 had a sanitary privy.

The dairy from which the milk supply for the Naval Academy is obtained was found in excellent condition. This dairy supplies milk to the mess hall of the academy, the naval hospital, and families of officers attached to the station. The dairy is located on a farm of some 700 acres at Gambrill, Md., 10 miles from the academy. The cows are a good grade of Holstein and are tuberculin tested. The barns are large and well ventilated and are kept clean. The cows are curried daily, the hair on the belly and legs is kept clipped, and before each milking the legs are rubbed down with wet cloths. The milkers wear clean white suits, and they are required to wash their hands before milking each cow. As soon as a cow is milked the milk is taken at once to a screened cooling room, where it is run over brine coils and cooled down to a temperature of about 36° F. It is then run into cans and in a short time bottled. This milk is the equal of certified milk and is produced at a cost of 10 cents a quart. The water supply at this dairy is from deep driven wells, anl the disposal of human excreta is by means of water closets, the effluents from which empty into a septic tank.

County health administration.—The administration of county health affairs comes under the jurisdiction of the deputy State health officer, who is in charge of the third sanitary district of Maryland. This district comprises Anne Arundel, Carroll, and Howard Counties. There was also a part-time county health officer for Anne Arundel. This district health officer was a member of the regular survey force and the county health officer gave his hearty cooperation to the work.

Malaria conditions.—The following is from the report made by Asst. Surg. Derivaux, who conducted his studies conjointly with the men making the regular sanitary survey:

"The climatologic conditions in the county are favorable to Anopheles mosquito production for about five months of the year, beginning about the middle of May and continuing until the advent of definite cold during the first weeks of October. The normal mean annual temperature of the Maryland and Delaware district is 53.7, with a normal precipitation of 41.95 inches. In 1914 the highest temperature reached in the district was 110, recorded June 24 at Cumberland, Allegany County, and the lowest was —30, observed at Deer Park, Garrett County, on December 26. The following tables are compiled from the United States Department of Agriculture Weather Bureau Reports, and summarize the observations taken at Annapolis, a station at an elevation of 45 feet above sea level, for the 10 years from 1905 to 1914:

TABLE 1.—*Climatological data, 1905 to 1914, Annapolis, Md.*

[Elevation 45 feet.]

Year.	Temperature in degrees Fahrenheit.					Precipitation in inches.						Sky.			
	Annual mean.	Highest.	Date.	Lowest.	Date.	Total for the year.	Greatest monthly.	Month.	Least monthly.	Month.	Total snowfall.	Number of rainy days.	Number of clear days.	Number of partly cloudy days.	Number of cloudy days.
1905	.....	96	July 18	2	Feb. 16	50.83	9.99	July ..	1.06	Nov...	.....	103	197	79	89
1906	.....	97	June 30	10	Feb. 6	51.63	8.87	Aug...	1.18	Sept..	.....	115	165	101	99
1907	53.3	92	July 23	6	Feb. 7	66.59	10.95	Sept..	3.43	Oct...	.....	117	171	83	111
1908	55.2	96	July 12	10	Feb. 9	52.50	9.53	July..	1.01	Nov...	.....	97	179	110	77
1909	55.3	95	June 25	9	Dec. 30	50.33	7.07	June..	1.65	July ..	36.5	82	186	92	87
1910	54.1	93	July 23	8	Feb. 7	52.45	9.36	Apr...	1.81	Feb...	.....	91	180	90	95
1911	.....	99	Aug. 11	....	....	......	14.05	Aug...	.....	....	.....	....	....	....	....
1912	56.2	95	Sept. 6	—3	Jan. 14	42.31	6.62	Mar...	1.02	Aug...	24.6	101	....	....	....
1913	58.9	100	July 2	12	Feb. 13	36.21	5.27	Mar...	1.20	Feb...	.....	105	124	39	202
1914	56.7	99	July 24	7	Jan. 14	40.24	9.31	Aug...	1.69	May ..	27	106	146	50	169

TABLE 2.—*Monthly maximum, minimum, and mean temperatures, Annapolis, 1914.*

Month.	Maximum.	Minimum.	Mean.	Normal.
January	72	7	34.4	....
February	64	8	34.3	....
March	74	22	42.5	....
April	81	30	33.1	....
May	92	41	63.9	....
June	98	54	73.9	....
July	99	54	78.3	....
August	96	58	76.6	....
September	91	48	69.7	....
October	93	31	57.5	....
November	80	23	46.7	....
December	61	8	37.0	....
	....	....	55.7	....

TABLE 3.—*Killing frosts recorded at Annapolis.*

	Last in spring.	Earliest in autumn.
1914	Apr. 10	Oct. 28
1913	May 12	Oct. 31
1912	Apr. 4	Nov. 3
1911	....	...do.....
1910	Mar. 16	Oct. 23
1909	Apr. 11	Oct. 13
1908	Apr. 5	Nov. 2
1907	Apr. 21	Nov. 14
1906	Apr. 19	Nov. 2
1905	....	....

"The watercourses of the county are very numerous and vary widely as to their physical characteristics, from the small streams and spring-fed woodland branches to the larger ponds and fresh-water marshes; nearly of these contain water normally the year around, and furnish the major portion of the permanent breeding places for Anopheles mosquitoes. Along the bay and in and about the wider portions of the rivers and creeks, tidal (brackish) marshes of variable ize are of frequent occurrence. The drainage of the county is, in general, oward the south and east into Chesapeake Bay, directly or ultimately through he rivers and larger creeks.

"Estimation of the prevalence of malaria has not been possible with any legree of accuracy in Anne Arundel County, as the disease is not well reported nd has not of late years occupied any place of prominence among the causes f death as listed by the State board of health. The following table is taken rom the records of the board for the last five years:

TABLE 4.—*Malaria morbidity in Anne Arundel County for 1911–1915 (July).*

	June.	July.	August.	September.	Total.
911					
912				3	3
913					
914	1		2		3
915					
Total	1		2	3	6

"Physicians practicing in different sections of the county are of the opinion hat malaria has of late been much less frequent than 6 to 10 years ago, and hat pernicious types are rare; most of the acute attacks seem to occur in he months of August, September, and October, and it is but occasionally that winter chills' require their attention; acute outbursts of malaria following njuries, parturition, appendicitis, etc., are sometimes noted. The average umber of new cases treated annually by each physician is said to be about 25, chiefly Tertian in type. Very few microscopic diagnoses are made, the nore nearly universal procedure being utilization of clinical and therapeutic ests alone, with no further observations on cessation of symptoms. The aucity of records as to types of infection, color, age, sex, etc., makes estimation of these features impossible.

"Self-medication with quinine and the use of the proprietary preparations ('chill tonics'), are probably fairly generally indulged in, although the sale of the latter class of remedies is said to be not unduly high; from the fact, hough, that nearly all of the countryside stores visited maintained a stock of several better-known varieties, it is evident that the demand is fairly constant. It is very probable that here, as elsewhere, little impression is made on the incidence of malaria as such, except the unwholesome effect of driving certain number of acute cases into latency and chronicity, with consequent ncrease in sources of gametocytes or Anopheline distributors.

"Screening, when considered as an antimalarial measure, is on the whole ery inefficient throughout the county, but inasmuch as the use of door and vindow screens has been directed against fly entry rather than against nosquito invasion, the conditions are, on the average, fair. Of the 7,543 iomes visited in the rural sanitation survey and of which 6,356 are noted vith reference to screening, 3,127 are recorded as being completely screened, 1,431 as partially, and 1,798 unscreened; of the 3,127 completely screened iouses, it is very doubtful that more than a small proportion are efficiently safeguarded against Anopheles. Installations of screens that were originally of a high grade but that have depreciated through lack of maintenance to lmost total uselessness are a common finding.

"The presence of Anopheles mosquitoes in Maryland and adjacent regions ias long been recognized; Hirschberg and Dohme (Bull. Johns Hopkins Hosp., XIII, 1902) report the finding of Anopheles maculipennis and punctipennis in the vicinity of Baltimore and in Brooklyn, in Anne Arundel County, and Symons (Bull 109, Md. Agr. Exp. Sta., 1916) mentions four species, Anopheles punctipennis, maculipennis, crucians, and barberi, as being present in the State of Maryland. In the present series of studies the question of the Anopheles was approached with a view of determining their relative distribution and the character and extent of their breeding places, with particular reference to the facilities for propagation of disease transmitters near human habitations. The usual methods were followed, i. e., the capture of adult insects in their hiding places and the development of imagines for identificatiton from larvae and pupae taken from various breeding places. The adults were taken, usually in a chloroform killing bottle, from dwellings, outhouses, stables, hollow trees, culverts, etc., a sufficient number being captured in each locality to establish a representative average. For the county as a whole, Anopheles punctipennis is far more plentiful than are A. quadrimaculatus and A. crucians, the latter being the most infrequently met with; the numeral ratio of these three species may be expressed in the results of a count of 1,640 adults taken in different sections. Of these, 68 per cent were punctipennis, 28 per cent quadrimaculatus, and but 4 per cent crucians. Anopheles barberi, a rare species said to breed exclusively in tree holes, was not sought for, as it is at present considered not of sanitary importance.

"As the widely differing conditions in the county are reflected directly in the Anopheles population, the figures given above are of value as in illustrative total only. Catches made in individual sections give very different results, depending on the physical characteristics of the neighboring water courses. At Herring Bay, a salt marsh region, only A. crucians was found; at Mayo, where both fresh and brackish water occur, of several hundred mosquitoes taken, about 50 per cent were A. quadrimaculatus, about 45 per cent crucians, and the balance punctipennis; finally, at a point between South River and Fishing Creek, near Arundel on the Bay, 52 quadrimactulatus, 5 crucians, and 2 punctipennis were taken in an outdoor toilet and a stable; the breeding places in this instance being a large shallow fresh marsh, about 50 feet away, and a brackish duck pond, about 300 feet removed.

"No attempt was made to visit every breeding place, as it was found early in the survey that practically every body of water or stream was contributing its share of Anophelines, the larger water courses proportionately less, as would be expected, and the smaller streams breeding profusely. Individual places will not be described in detail, except a few as illustrations, as each community here as elsewhere presents its own local peculiarities, favorable or unfavorable for the production, and the character of those factors determines the preponderating species. In general, the small, shallow branches with clear running water, coursing through woods and meadow lands, were found to be principal sources of Anopheles punctipennis, while the slower moving streams, and vegetation-lined pools and marshes (fresh water) were more favorable to the production of A. quadrimaculatus. Regarding A. crucians, there is every indication that this species has, in this section, a marked preference for the partially salt waters; adult crucians were only found within reasonable distance of flight of brackish waters, and on the other hand, the only imagines developed from larvæ and pupæ taken from such waters were of this species.

"The problem presented by the brackish marshes is an important one from the point of view of malaria control and should receive further attention. These marshes are collections of mixed ground and tidal waters, in some cases tidal waters alone, that occur in and about the indentations of the tidal rivers and creeks, and along the bay shores. They vary greatly in size, and are usually quite shallow and contain a more or less profuse growth of aquatic vegetation; the water is in most instances motionless, except in those marshes that communicate constantly with the main stream and are subject to tidal fluctuations. Several of these marshes were examined, and two, both landlocked, were found to be serving as breeding places of choice for Anopheles crucians. One is at Round Bay, on the Severn River, the water having a chlorine content of 4,300 parts per million, the other near Arundel on the Bay, physically similar, and with a chlorine content of 4,700 parts per million, the equivalent of 0.74 per cent NaCl, or about one-quarter of the salinity of deep-sea water; in both of these marshes, Anopheles larvæ were found in sufficient numbers to be of importance, and from these larvæ, only imagines of the crucians species developed. In two other brackish marshes, in which tidal fluctuations occurred and the ingress of small fish was easy, no larvæ could be found.

"Road and railroad construction have been responsible for the formation of a few breeding places of importance. At Woodwardsville (Patuxent station) the fill of the right of way has impounded the overflow of the Little Patuxent River, a large permanent swamp resulting in which quadrimaculatus breeds plentifully. The same type of place occurs at Academy Junction at the intersection of the lines. In both of these places abundant Anophelines can be found and malaria is said to be common. Inattention to grade levels in the location of some of the culverts traversing the State boulevard has caused accumulations of permanent waters that are being amply utilized by disease-carrying varieties of Anopheles for propagation purposes, notably 1 mile and one-half mile north of South River Bridge are two such swamps. On the section of the same road between Annapolis and Baltimore the same has been effected. In South Baltimore (Curtis Bay) near the junction of Patapsco and Pennington Avenues, are two ponds lying alongside of Pennington Avenue that owe their formation to improperly set culvert pipes, and that furnish about 90 per cent of the Anophelines of this section. In this case, depression of these culverts about 16 inches would remedy a bad situation which affects several thousand people.

"There remains for discussion but one more factor in malaria distribution, that of the chronic cases and the carriers from whom the very numerous Anophelines of the county receive their parasites. This element can not have been large during the past few years, as the case rate, as gathered from the physicians in practice in this county, is out of all proportion to what would be expected, if the enormous supply of mosquitoes capable of transmitting malaria had access to but a moderately generous gametocyte supply. In view of the absolutely unimpeded facilities for Anopheles propagation, and the almost total lack of use of any prophylactic measures save that of a meager amount of unusually imperfect screening there can be no other explanation of the apparently low rate of incidence than that of a reduced supply of parasites. Obviously, this is a condition upon which no dependence can be placed for future years, particularly as there exist in this section economic conditions, notably the canning and packing industries, and 'picking' during the summer season, which require the introduction of labor, male and female, from without. The class of people brought in for these works comprise the lowest grades, white and colored, in the county. Their work begins in the spring, with the ripening of the first crops, and continues until fall, when the latest of the fruit and vegetable harvests are made, and the canning of the last of the tomatoes and pears ends their season. Housed as they are during the summer months, in frame shacks for the greater part unprotected by window glass, much less by screens, bedded on the floors in straw, cooking out of doors over mud stoves, and living as they do in total disregard of even the most rudimentary of sanitary principles, these individuals constitute a menace to the people in whose community they happen to be for the time of the highest importance. It has not been possible to arrive at an estimate of the number of people engaged as described above, but the presence in the number of but a small proportion of chronic cases of the more severe type of malaria, would be all that would be required to cause a distinct outbreak. The solution of the problem of these people lies with the employer, as they are obviously incapable of looking after themselves, and in addition represent the danger itself rather than the endangered; improvement in their housing and living conditions and the use of screens would minimize the risk materially.

"*Recommendations.*—While prevalent in Anne Arundel County to the extent of probably several hundred cases annually, malarial fever does not represent a particularly urgent problem, and measures for its control on the part of individuals are to be recommended, rather than extensive eradicative undertakings directed against the insect intermediary.

"Disease-bearing Anophelines have every advantage of climate, a season favorable to their propagation that lasts about five months, and such an abundance of breeding places of first choice easy of access, that the amount of work that would be required to diminish perceptibly their numbers, for the county, as a whole, would be out of all proportion in cost to the results that would be gained. Antimosquito work is applicable and should be undertaken in every instance where a sufficiently large number of people are affected, as in villages and towns, and in every instance of particularly bad breeding places that are within easy flight distance of human habitations. Such places should be rendered unfit for propagation of mosquitoes by the use of drainage, oiling, training, or the introduction of natural enemies (top feeding fish), or combinations of these methods, depending on the local peculiarities, the work having been preceded by the usual preliminary survey for species and numbers of mosquitoes, and the results checked by reexaminations, frequently repeated. This professional supervision should be done by some person familiar with the details of the work in those communities in which it is contemplated.

"The question of mosquito breeding places that have resulted from interference with natural drainage levels, in road, railroad, and other construction, should be taken up with those responsible for the condition and eradication, or at least restitution to safe condition, required. In all new enterprises these sanitary features should receive consideration, and the leaving of undrained borrow pits, the improper installation of culverts and drains, etc., whereby dangerous breeding places result, should not be permitted.

"With reference to the salt marshes of the type in which Anopheles crucians have been found propagating in these studies, it is recommended for the present that channel ditches be dug to the nearest main body of water, so that tidal fluctuations will flush them and give access to continual supply of fish. Where sufficiently close to communities they may be well used as dumps for refuse, and in that way diminish their area.

"The single measure that would be productive of the greatest benefits would be a thorough campaign of education as to the nature of malaria, the mode of its transmission, and the methods for its prevention that residents can apply themselves. This is strongly recommended, for adults by means of bulletins, public meetings, and demonstrations, and for school children by the use of elementary 'catechisms' and lectures. It is believed that general improvement in the now very mediocre screening, as detailed in the body of this report, will follow such measures and prevent a very considerable proportion of the now undue malarial incidence. Especial emphasis should be laid in this instruction

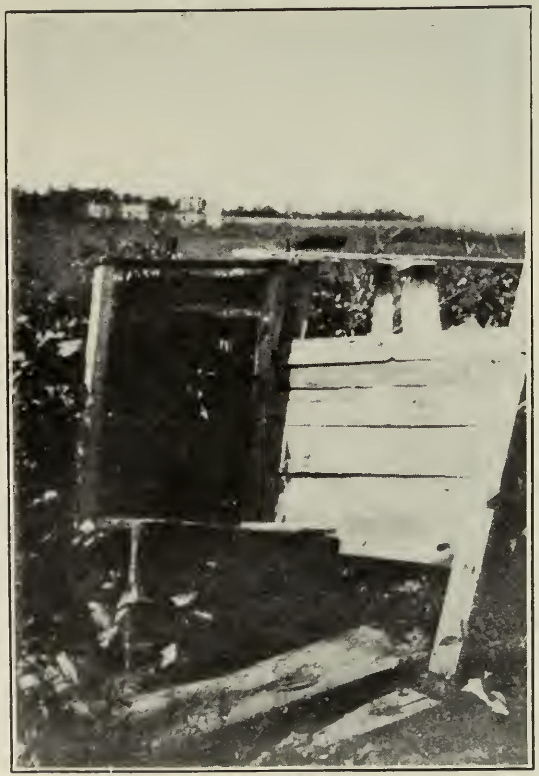


Fig. 33.—A privy used by a large number of fruit pickers at one of the camps in Anne Arundel County, Md. This privy was grossly insanitary and afforded partial privacy from only two points of the compass.

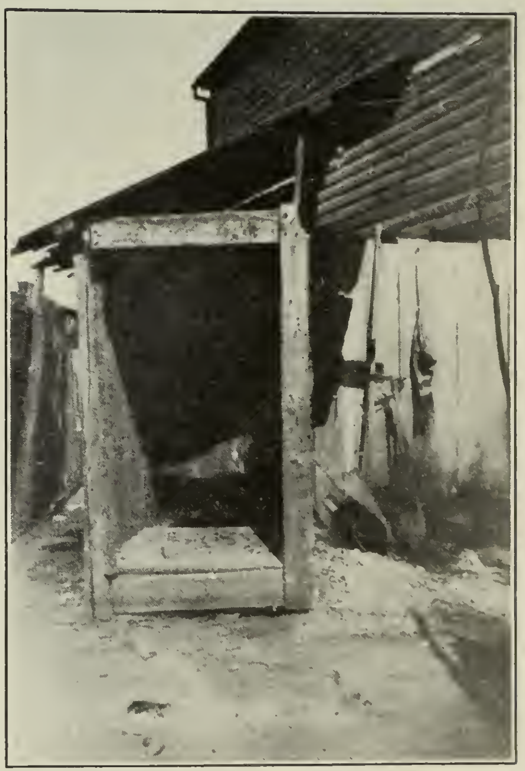


Fig. 34.—Grossly insanitary privy in Annapolis, Md., in which excreta, without disinfection, from a typhoid fever patient were being deposited.

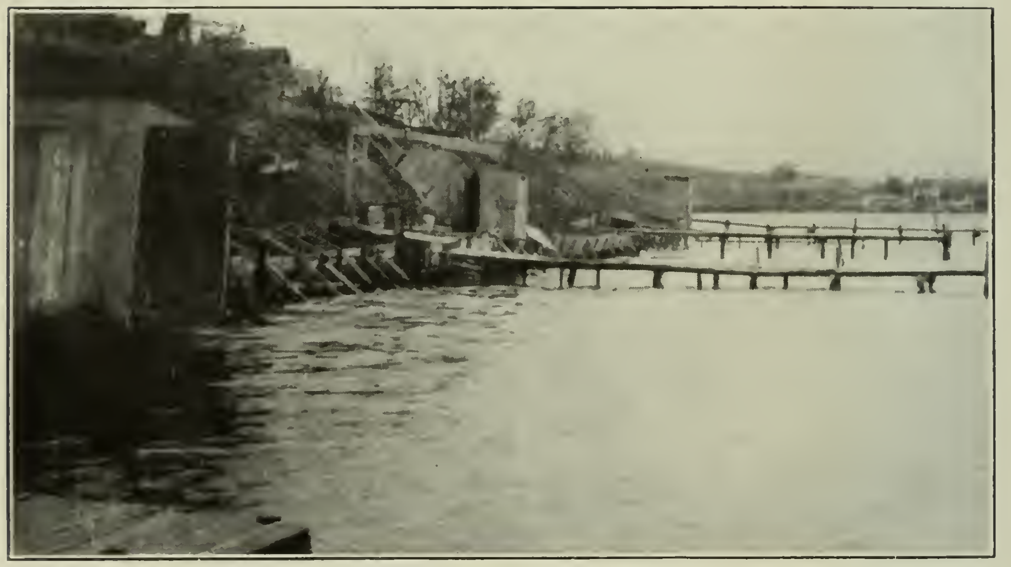


Fig. 35.—Open toilets overhanging water frequented by boating, fishing, and swimming parties, in Anne Arundel County. Crab fishing was said to be particularly good in this vicinity.

on the proper use of mosquito bars, as well as screens, in the presence of a case of malaria, and upon the fact that the disease is not a trivial affair to be treated by home remedies, etc., but that it should in every instance be taken care of under the supervision of a competent physician. The prophylactic use of quinine should be recommended chiefly for the use of those living in camps in the Anopheles season, and for the temporary occupants of the shore clubs and summer houses. Its use generally does not appear necessary in the county, where other measures are undertaken.

"Thankful acknowledgment is made of the cooperation of the Division of Chemistry, Hygienic Laboratory, United States Public Health Service, for salinity determinations made of the marsh waters, and of the Bureau of Entomology, Department of Agriculture, in making check determination of some of the mosquitoes."

FINDINGS IN ANNAPOLIS.

Annapolis, the capital of Maryland, is situated on the Severn River. It is essentially a residential city. Fishing and oystering are the principal industries. The city is surrounded on three sides by water. It has a population of about 9,000, of which 41 per cent are negroes. The United States Naval Academy and St. John's College are located in Annapolis. For nine months of the year the former adds about 2,000 and the latter about 250 to the population of the community. The city, due to is historic interest and its ready accessibility from near-by larger cities, is frequented by many tourists. The older parts of the city, comprising about four-fifths of the residences, are very closely built up. Due to the congestion, housing conditions are bad. The tuberculosis rate is high. In a considerable area occupied almost exclusively by negroes housing and general sanitary conditions are particularly bad. For the city as a whole general sanitary conditions appeared, from casual observation, to be far from satisfactory; but from close inspection they were found, except for the congestion in housing, to be surprisingly good. The alleys generally were found clean. All of the dwellings in the city, with the exception of 300, were found provided with water-closets connected with the sewerage system. The 300 homes with privies were for the most part in the section, uptown, occupied by negroes. A considerable number of privies were found, however, in a section downtown, near the walls of the Naval Academy Reservation. The privies consisted of holes in the ground, several feet deep, with dilapidated, poorly kept buildings over them. Most of the pits were overflowing and in most of the privies the woodwork of the seat was very foul. In one instance it was found that the excreta from a person with a severe case of typhoid fever were, without disinfection, being deposited in one of these privies (fig. 34), presenting the worst possible condition; within 15 feet of the privy was a large collection of stable manure in which flies were breeding by millions, and within a radius of 100 feet of this privy there was a number of unscreened dwellings. On invitation, the mayor of the city accompanied the inspector to observe this situation. About 10 days later some disinfectant was applied to the privy.

The city sewers emptied into the river at ends of streets along the water front. At the time of the survey a plan was under consideration to install a trunk sewer to carry farther away the sewage of Annapolis and the Naval Academy, and also of Germantown and Eastport.

The water supply of Annapolis is furnished by the Annapolis Water Co., a corporation whose stock is owned by the city. The company owns the land—about 500 acres—on which the pumping station and storage reservoirs are located. The plant is 4 miles west of Annapolis. The supply of water is obtained from surface streams whose watershed, including that of the auxiliary water supply, comprises about 4 square miles. The shed was not patroled. At the time of inspection, in May, 22 families were found living on the watershed. The tracks of the Washington, Baltimore & Annapolis Railroad also cross the watershed for a distance of 2 miles. Auxiliary to the surface streams there are six artesian wells, 160 feet in depth, which can be used in time of drought.

The water supply usually was not subjected to purification process, other than storage, and, on bacteriological examination, showed evidence of pollution. At certain periods hypochlorite of lime was applied to the water supply, but in a crude fashion, with little effect. The city water supply is used by practically the whole population. Only six wells were found in the city. These were dug wells, from 15 to 20 feet in depth, all of which were obviously polluted. The systems for removal and disposal of stable manure, garbage, and other city refuse were inadequate and faulty. The city health department was inadequate and inactive. A visiting nurse, furnished by the Annapolis branch of the Maryland Society for the Prevention and Cure of Tuberculosis, was active and was rendering high-grade and effective service in Annapolis and vicinity.

TYPHOID FEVER PREVALENCE.

The typhoid fever prevalence has been fairly high for the county as a whole and disproportionately high in the southeastern section of the county.

Of the 30,666 persons enumerated in the rural households, 1,677, or 5.5 per cent, gave a history of having had typhoid fever. The rate for Annapolis appears to have been in recent years considerably lower than that for the rural sections of the county. The number of cases and deaths from typhoid fever reported, by years, from 1910 to 1914, were as follows:

Year.	Cases.	Deaths.	Fatality rate.	Year.	Cases.	Deaths.	Fatality rate.
			Per cent.				*Per cent.*
1910	62	19	30	1913	130	10	7.5
1911	107	20	18	1914	83	8	9.6
1912	67	16	23				

These figures suggest that until 1913 the report of cases was far from complete.

In the course of the canvass of rural homes, histories were obtained of 69 cases, but of only 3 deaths in 1914. This finding shows two points of interest, (1) that the report of cases was probably incomplete, and (2) that a house-to-house canvass will fail to obtain histories of a considerable proportion of deaths which have resulted from a disease even as distinctive as typhoid fever.

Bedside prophylaxis was found in the course of the survey to have been generally inadequate. Histories of measures carried out for 88 cases occurring between January 1, 1914, and June 1, 1915, were as follows: For 29 no attempt at precautions, for 24 some inefficient measures, and for only 30 had any measures approaching adequacy been carried out. Excreta from patients had been burned in 3 cases, buried in 33 cases, thrown out in the yard or field, without treatment with disinfectants, in 30 cases, and dumped into tidal creeks in 17 cases. The last place of deposit mentioned is of interest because in these tidal creeks were numerous small oyster beds from which oysters were obtained for use mainly by families in the immediate vicinity.

SANITARY MEASURES RECOMMENDED.

For the country homes improved methods of excreta disposal, protection of water supplies from pollution, and screening of dwellings to exclude mosquitoes as well as flies, were generally recommended.

For Annapolis the measures particularly recommended were (1) the installation of a chlorine plant for continuous and adequate treatment of the public water supply, and (2) the sanitation of 300 insanitary privies at once, and their abolishment by extension of sewers and having water closets installed in their stead as soon as practicable.

COOPERATION.

The newspapers of Annapolis gave excellent publicity to the work and strongly supported editorially the sanitary measures recommended.

The district nurse worked zealously and ably to assist. She visited the cases of typhoid fever and of infant diarrhea in Annapolis and vicinity and rendered excellent service in getting bedside precautions carried out.

The local civic organizations, the practicing physicians, the clergymen, the officials of the county and of the city, and the prominent citizens generally gave good cooperation. The State Medical and Chirurgical Faculty sent its health exhibit to Annapolis for 4 days in August. This helped in the educational work.

RESULTS.

Country homes.—Groups of representative country homes in different neighborhoods were revisited in September to ascertain the degree of sanitary improvement accomplished subsequent to the first visit of survey. The aggregate number of homes in these groups was 1,844.

At 470 homes (or 25.38 per cent) high-grade sanitary privies were found, with water-tight vessels and of fly-proof construction, in place of the insanitary privies noted on the first survey; while at an additional 289 homes (or 15.5 per cent) marked improvement had been made in the construction of the privies.

Besides the improvement in methods of excreta disposal, 203 homes (or 11 per cent) had made marked improvement in the protection of their water supplies, and 55 (or 3 per cent) of the homes had screened against flies.

Incorporated towns.—The 17 homes comprised in the incorporated town of Arundel on the Bay were dealt with as country homes. In this little town the scavenger service was radically improved. Several of the "B" type privies were converted into "A" type. It was stated by the property owners that at all the homes the privies would be fixed and the other measures recommended would be carried out before the colony would be occupied the following summer.

For Annapolis a liquid chlorine plant for the treatment of the public water supply was installed and put into operation on August 20. The formal recommendations for this installation and for the sanitation of the privies in the city were made by representatives of the Public Health Service and of the State department of health before a special meeting of the city council on the night of May 17. At this meeting a petition from the ladies of the local civic league indorsing the recommendations and requesting that they be carried out was read. Action on the recommendation for the sanitation of the privies was not taken until the latter part of September. Then the matter was referred to a committee of the council. The committee reported favorably with a draft of an ordinance establishing a scavenger service and requiring all privies to be made of sanitary type. The ordinance was adopted by the city council on September 28. It was to become effective on December 1, 1915. The ordinance, however, was not enforced, since it was decided to have the sewers extended to the areas in which the privies were located.

By the summer of 1916 all of the 300 privies, with the exception of about 25, had been abolished and water-closets with sewer connection installed in their stead. It is unfortunate that the work of making the privies sanitary was not carried out soon after the recommendation for it was made. A number of cases of serious illness and several deaths in Annapolis in the summer and fall of 1915 appeared to be clearly attributable to infection spread from the insanitary privies in that city.

The mistake of the officials of Annapolis is unfortunately common. Town officials in many instances put off or decline having privies made sanitary because sewer extensions and abolishment of privies some time is expected. In the meanwhile sickness and death unnecessarily results among the citizens.

Typhoid-fever reduction.—The typhoid-fever rate for the two years 1913 and 1914, immediately preceding the survey, had been much lower than that for the several previous years. With this reduction already accomplished, a further marked reduction, as an immediate result of the survey, could not reasonably be expected. In 1915, 94 cases, with 9 deaths, were reported, as against 83 cases, with 8 deaths, reported in 1914. It is certain that the report of cases and deaths in 1915, however, was more accurate and more nearly complete than in the previous year. From definite data it may be reasonably assumed that without the intensive work carried out in connection with the survey the case incidence would have been higher in 1915 than it was. There was between May 1 and November 1 in that year no development of secondary cases in homes in which cases had occurred. This remarkable result was apparently due to the prompt institution of precautionary measures at the bedsides of primary cases. In this period every case—all told, 75—was visited promptly by members of the survey force. Most of the cases were visited within five days of the development of definite symptoms. Care of the hands and utensils, the use of disinfectants, and methods of disposal of the patient's excreta, were explained and demonstrated. Antityphoid inoculation was offered, without cost, to the other members of the family. In every family so visited every member except the patient, children under 2 years of age, and very elderly persons accepted the offer and the vaccine was administered by the district health officer or by the attending physician. The only case which might possibly be regarded as a secondary case was in a child who developed definite symptoms seven days subsequent to the first visit to the first case in the home. It is highly probable that this child was incubating the infection before the precautionary measures at her home were instituted.

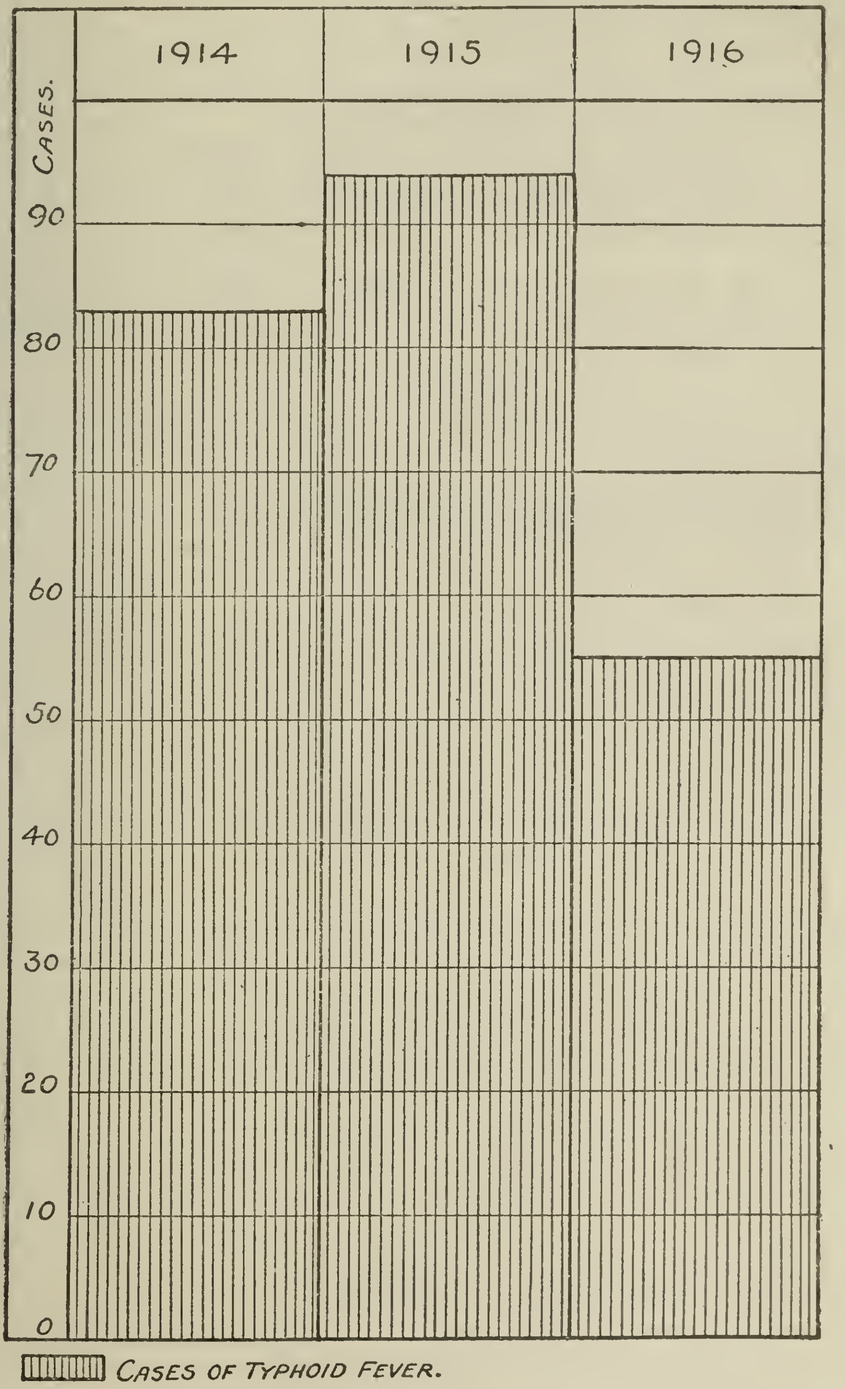
In 1916 there was a still further reduction in typhoid morbidity in the county, there being only 55 cases reported, as against 94 for the previous year (chart 9).

RESURVEY IN 1916.

To ascertain what progress in sanitation was being made in the county subsequent to the period of the survey, an officer of the Public Health Service, Asst. Epidemiologist F. E. Harrington, was detailed to spend a few days in the county in the fall of 1916 to make observations in representative sections. He made his observations in company with the district health officer. The report of his findings was as follows:

"Annapolis, the county seat, has extensively improved its disposal methods. The sewer system of the town has been extended to include all but 25 homes, and at all sewered homes the privy has been removed. At one point the sewers were extended by the county authorities into the county, so as to drain a small settlement beyond the city limits. The unsewered homes in the city are to be sewered as soon as the extension can be made. The water supply of the city has been kept good by the systematic use of chlorine process. Larger impounding reservoirs have been built, and the system extended to the entire city.

CHART 9:—TYPHOID FEVER CASES REPORTED IN ANNE ARUNDEL COUNTY, MD.



A marked improvement in the city generally was noted, especially in the additional paving of streets and the removal of garbage and trash.

"*Curtis Bay.*—This section of the county, embracing about 25 square miles, had in process of construction a sewer system that will drain all homes within the district. The work on this system will soon be completed according to present arrangements under the control of the county. A general improvement in disposal methods in the rural sections was noted, with an increase in the proportion of privies of "A" type. Some of the improvements have been made following a case of typhoid fever.

" Improvements at rural schools were found, and the teachers were interested in the subject of safe disposal. As the new privies are required and built, the concrete vault type, fly proof, has been installed.

"At homes patronized by summer boarders sanitary privies were found. These privies were marked with a placard stating the fact that the privy was of an approved type, and, upon inspection, had been passed by the district health officer.

" During 1916 there have been no cases of typhoid fever among persons returning to Baltimore from Anne Arundel County traceable to the county.

" In 1916 the State department of health made a resurvey of some sections of Anne Arundel County, and an improvement in privy construction was found to the extent of 50 per cent over what was reported as found upon the completion of the survey in 1915.

" The district health officer visits each reported case of typhoid fever in the district, and bedside prophylaxis is required."

SANITARY SURVEY OF WILSON COUNTY, KANS.

In response to a request from the State Board of Health of Kansas, the survey was extended to a county in that Middle West State. Wilson County was selected for the survey. That county appeared to present fairly representative sanitary, economic, and social conditions for the more progressive sections of the State generally, but, according to the records, the typhoid-fever rate for several years past had been considerably higher for Wilson County than that for the State as a whole. The apparent progressiveness and prosperity of the county and its comparatively high typhoid rate were the special reasons for the selection of this county for the survey.

The survey of Wilson County was begun April 23, 1915, and terminated October 21, 1915.

GENERAL CONDITIONS.

Wilson County is located in the southeastern part of the State of Kansas, about 30 miles west of the Missouri line and about 45 miles north of the Oklahoma line. The county is nearly square in shape, being about 24 miles on each side. The political divisions of the county are 15 townships. Two small rivers, the Fall River and the Verdigris River, traverse the county from the northwest portion to a point just east of the middle of the southern border line.

The general contour of the land is rolling or hilly, with low level stretches along the streams. This last feature is conducive to inundation of considerable areas in times of prolonged heavy rains. On several occasions in the spring and early summer of 1915 the rivers and streams were swollen out of their banks, bridges were washed away, and the surrounding country flooded, making travel by road in some sections difficult or even impossible. The field work was repeatedly interrupted by these conditions and by the unprecedented rainfall which caused them.

The surface stratum of soil is essentially clay, with a varying admixture of sand and gravel for different sections of the county. The clay stratum rests on a stratum of limestone. The limestone outcrops in few places.

The county is favored with abundant natural resources. Oil and gas are plentiful in certain districts. Much of the clay is workable into bricks or terra cotta. The land generally is highly fertile. Most of it is in a good state of cultivation. Practically the whole county is in open prairie country. Agriculture is the principal industry. Wheat, alfalfa, oats, corn, and kafir are the main crops. The mining of oil and gas, the quarrying of limestone, the making of bricks and cement, the smelting of zinc ore, the manufacture of window glass, and the refining of petroleum constitute the other important industries. Two large cement plants and five large brick-making establishments are located in the county.

The railroad facilities are good. The wagon roads generally are unimproved. The public highways gridiron the county, dividing most parts into sections about 1 mile square. This arrangement along with the openness of the country greatly facilitated the finding of every home in the country neighborhoods for canvass and survey. In each mile-square section there would be, as a rule, obvious from any of the higher points in the roads bounding it, the three or four dwellings on the farm or farms located in the section.

Distributed through the county are towns and villages which form true community centers. Considerable proportions of the persons who work on the farms reside in the towns.

According to the census reports, the county had a population in 1910 of 19,810, an increase of 4,189 over that of 1900. Most of the increase in the decade is accounted for by the increase in population of the four principal incorporated towns, as is shown in the following table:

Town.	Population.		
	1910	1900	Increase.
Fredonia	3,040	1,650	1,390
Neodesha	2,872	1,772	1,100
Altoona	1,462	299	1,163
Buffalo	807	299	508
Total	8,181	4,020	4,161

Less than 5 per cent of the population were foreign born. Only 0.7 per cent were negro. Only 1.2 per cent of persons 10 years old and over were illiterate.

The number of dwellings in the county was given as 4,676. The land area is 581 square miles. The population per square mile for the whole county was 34.1 and for the rural sections 23.9. The number of farms was 2,024. The number of acres in the farms was 330,160; 42.2 per cent of the farms were operated by tenants. The value of the farms with the buildings on them was given as $13,969,675.

Thus the county as a whole presented, from an economic standpoint, fairly high-grade rural conditions.

According to the statistics of the State board of health, the death and birth rates for the three years before the survey were as follows:

Year.	Death rate per 1,000.	Birth rate per 1,000.
1912	10.2	28.8
1913	12.3	25.0
1914	11.0	27.7

Deaths from the notifiable diseases were recorded as follows:

Diseases.	Number of deaths.		
	1912	1913	1914
Typhoid	4	9	7
Measles	1		
Scarlet fever	5	1	1
Whooping cough	8	4	2
Diphtheria	2	2	7
Dysentery	2	1	2
Tuberculosis	9	21	10
Diarrhea and enteritis (under 2 years)	9	16	4

The low death rate and the general healthfulness of the county are apparently accounted for largely by the even distribution of the sparse population in the extensive rural districts.

PLAN AND SCOPE OF SANITARY SURVEY.

The work comprised (1) a canvass and a sanitary survey of all the rural homes in the county; (2) a sanitary survey of all the homes in the incorporated towns; (3) a sanitary survey of all schools, churches, railway stations, post offices, and stores in the rural districts; (4) public addresses on the subject of sanitation, with lantern-slide illustrations, in all sections of the county; (5) distribution of literature on different phases of the subject of sanitation; (6) the organization of official, commercial, and civic forces for a celebration of sanitary accomplishment; and (7) the epidemiological investigation of cases of typhoid fever as they developed.

The working force consisted of three medical officers of the Public Health Service and two medical students. The latter were furnished for about half of the survey period by the State board of health and were carried for the remainder of the period as temporary appointees (attendants) of the Public Health Service.

Headquarters were established at Fredonia, the county seat. The other towns were used as bases for the field men as the work progressed from township to township. Automobiles were used principally for transportation.

The plan and purpose of the work was well advertised to the citizens at the beginning of the survey through the circular letters, signed by the Surgeon General of the Public Health Service and the secretary of the State board of health, through articles in the local newspapers and through public meetings held in several different sections of the county.

In the course of visits to the homes effort was made in every instance to talk with the head of the household. This was difficult in many instances, however, because the survey was made in the busiest period of the farming season, and many of the farmers at the time of the visit to their homes were engaged at work in fields a mile or more distant from the dwelling. Many of the farmers who were not at home at the time of the visit later on attended the public meetings and so heard explained the facts of sanitation.

Twenty public lectures were given. The average attendance at the lectures was 65, making a total of 1,430 persons. In this county the attendance at the lectures was made up for the most part by men. Among the lectures, one of specially far-reaching importance, judging by the interest with which it was received, was delivered to an assemblage of 95 of the school-teachers of the county. On "Sanitation day" the address on sanitation delivered by the officer of the Public Health Service in charge of field studies of rural sanitation followed the address of the governor of the State and was attended by a crowd estimated at over 7,000 persons.

The survey covered 4,390 dwellings, 96 schools, 35 churches, 11 railroad stations, and 8 post offices.

FINDINGS.

Due to a misunderstanding in the tabulation of the survey cards for this county, no separation of most of the data was made for country and town homes. The findings below recorded, therefore, apply to the aggregate of 4,390 homes surveyed, of which 2,320 were country homes and 2,070 were town homes. The town homes were comprised in the five incorporated towns, Fredonia, Neodesha, Altoona, Buffalo, and Buffville. The detailed discussion of the findings in each of these towns enables an estimate of the difference in conditions between the country homes and the town homes.

Of the 4,390 homes visited, 2,204 were occupied by the owners, 1,758 were occupied by tenants, and for 428, whether the home was occupied by owner or tenant, was not recorded.

Number in household.—In 2,541 of the homes in which the number in the household was enumerated, the total number of persons was 15,215. This gives an average of nearly six to the household. According to age and sex the households were as follows:

Age in years.	Male.	Female.	Total.
0 to 10	2,049	1,976	4,025
10 to 20	1,532	1,407	2,939
Over 20	3,951	4,300	8,251
Total	7,532	7,683	15,215

Race.—Of the homes canvassed 97 per cent were occupied by white families and 3 per cent by negro families.

Popular attitude toward sanitary work.—At 2,141 of the homes the attitude of the responsible members of the household toward the sanitary measures discussed was ascertained and recorded. At 626 the attitude was highly favorable, at 1,172 keenly interested, at 304 indifferent, and at 39 opposed.

Number of rooms to house.—Seventeen dwellings had only 1 room to house; 192 had 2; 496 had 3; 960 had 4; 1,077 had 5; 715 had 6; 366 had 7; 454 had 8 and 113 had 9.

General appearance of residence.—For 3,974 recorded as good, for 339 as fair, and for 77 as poor. Thus the upkeep of the premises averaged high.

Construction of house:

Frame	3,986
Brick	197
Stone	65
Log	7
Frame and brick	135
	4,390

General cleanliness.—The general cleanliness of 3,455 homes was reported as good, of 772 fair, and of 163 poor.

Cellar or basement.—One thousand five hundred and seventy-nine of the homes were provided with a cellar or basement, 2,570 had none, and for 241 this datum was not recorded.

Screening in summer.—At 3,710, or 84.51 per cent, of the homes the screening of the kitchen and dining room was complete, at 571 only partial, excluding only about half the flies seeking entrance; and at 109 there was no screening of the kitchen and dining room. Thus the screening of homes in this county was far above that of the average county.

Stable manure.—At most of the homes at which animals were stabled the manure was hauled to the fields in the spring and fall and scattered. At only 33 was provision made to prevent flies from breeding in the manure in the summer season.

Disposal of human excreta.—Of the 4,390 homes visited, 991 were found to be provided with water-closets, 3,136 had privies, and 263 had no toilets of any kind.

Of the 991 homes provided with water-closets, the effluents from the water-closets were connected with town sewerage systems at 954, were disposed of through septic tanks with subsoil distributing pipes at 6, and were discharged into insanitary cesspools at 31.

Of the 3,136 privies in use, only 9 were "A"-type sanitary privies, provided with water-tight receptacles, and of fly-proof construction; 242 were "B"-type privies, provided with water-tight receptacles but not of fly-proof construction; 790 were "C" type, most of them with pits several feet deep to receive the excreta, which was fairly well protected against invasion by flies; 1,364 were "D"-type privies, having no receptacles and with contents freely exposed to flies, but protected by boarding from invasion by larger predatory animals; and 731 were "E" type, open at the back, allowing free access not only to files but also to chickens and larger anmals.

Eight hundred and forty-nine of the privies were within 50 feet of the kitchen door, 1,986 were between 50 and 100 feet from the kitchen door, and the other 301 were more than 100 feet distant. Two thousand one hundred and seventy-four of the 3,136 privies were so situated and of such type that the contents were likely to get into the water supply, yard, truck patch, or fruit ground, either by being carried by domestic animals or on the feet of persons, or by surface washing or subsoil seepage.

In 1,554 cases definite information was obtained as to whether or not the privy was used by all members of the household. Of these 1,554 privies only 461 were used by all, and the other 1,093 were used by only part of the household, as a rule the women and children, the men resorting usually to stables to void their excretions.

Definite data on the method of disposal of privy contents were obtained in 1,910 instances. In 1,196 instances the privy contents were buried, in 433 they were hauled away and dumped on the surface of the ground, in 115 used as fertilizer, and in 166 instances the privies were never cleaned, the contents being disposed of by chickens and other animals or by surface washing. At only 791 homes were the privies cleaned regularly and frequently.

Considering the methods of excreta disposal (*a*) at town homes and (*b*) at country homes, the more salient points were as follows:

(*a*) Of the 2,070 town homes, 936 were provided with water-closets, 1,117 with privies, and 17, or 0.82 per cent, with no toilets of any kind. Of these 936 water-closets, 929 discharged into sanitary sewerage systems and 7 into insanitary cesspools. Of the 1,117 privies at town homes, only 3 were of sanitary "A" type.

(*b*) Of the 2,320 country homes, 55 were provided with water-closets, 2,019 with privies, and 246, or 10.69 per cent, had no toilet of any kind. Of these 55 water-closets, 25 were connected through sewer extensions with town sewerage systems, 6 were connected with private sanitary sewerage systems, including septic tanks with subsoil distribution of effluent, and 24 discharged into insanitary cesspools. Of the 2,019 privies at country homes, only 6 were of sanitary "A" type. The type of privy found in use at country homes most commonly was one consisting of a pit in the ground from 1 to 4 feet deep with the superstructure fitting over the pit so as to exclude animals, such as chickens and dogs, but so as to permit flies and burrowing insects and animals (rats) to have free access to the excreta. In view of the limestone stratum near the surface of the ground in many places, the "pit privy" in this county was, from a standpoint of water pollution, at least, as bad if not worse than a fairly well cared for surface privy.

Water supply.—Of the 4,390 homes visited, 86 had no source of water supply on the premises, and the families obtained water from neighbors' supplies; 1,806 obtained their water supply from wells, 1,512 from cisterns, 93 from springs, 320 from public (piped) supplies, and 573 homes had two or more sources of water supply, including usually either a well and a cistern or a town (piped) supply and a well or cistern.

Of the 1,806 wells recorded, 1,472 were dug wells, 276 drilled, 9 driven, and for 49 the type of well was not recorded. One hundred and thirty-two of the wells were protected from subsoil seepage by iron casing, 104 by terra-cotta casing with cemented joints, 1,258 had casing of rock, and 146 had casing of brick. The rock and brick casings served only as supporting walls and did not exclude subsoil drainage. For 166 of the wells the presence or absence of casing was not recorded. One thousand one hundred and fifty-three wells were protected to some extent against surface drainage by water-tight curbing, and 975 were provided with water-tight platforms. For 831 the platform over the well was not water-tight, and for 589 the curbing around the mouth of the well was not water-tight. For 64 the character of the curbing was not recorded. From 834 of the wells water was lifted by means of a pump, and from the remainder by means of buckets with ropes or chains. Two hundred and seventy-seven of the wells were down slope from insanitary privies, and 296 were down slope from stables. The distance between well and privy was less than 50 feet on 555 premises, between 50 and 100 feet on 766, between 100 and 200 feet on 310, and over 200 feet on 175 premises. Three hundred and seventy-three of the wells were within 50 feet of stables, 596 between 50 and 100 feet, 500 between 100 and 200 feet, and 337 were over 300 feet distant from stables. In depth, 54 wells were under 10 feet, 250 between 10 and 25 feet, 696 between 25 and 50 feet, and the remainder more than 50 feet.

Of the 93 springs, 43 were down slope from privies and 21 were down slope from stables. The distance between spring and privy on 7 premises was less than 50 feet, on 9 between 50 and 100 feet, on 15 between 100 and 200 feet, and on 62 over 200 feet. The distance between the spring and the stable was between 50 and 100 feet for 18 springs, between 100 and 200 feet for 14, and over 200 feet for 61. As some protection against surface drainage, 41 of the springs were provided with walls and curbing, and 39 had ditches around them.

Of the 1,512 cisterns, 1,295 appeared from the statements and evidence obtained to be water-tight, 156 were not water-tight, and for 61 opinion on this point was not recorded. Surface drainage from privy or stable was toward the cistern in 62 instances, was not in 1,295, and not recorded in 155. One thousand one hundred and eighty-two cisterns had water-tight tops and 330 did not have.

Of 2,437 homes at which an expression of opinion as to the safety of the water supply was obtained, the head of the household regarded the water as unsafe in only 133, or 5.5 per cent of instances. Of 3,926 homes on which the inspector's opinion on this point was recorded, the inspector regarded the water supply as unsafe for 1,299, or 33.05 per cent of instances.

The wells and cisterns in use were found for the country and the town homes to average about the same.

Sale of foods.—From 156 of the homes visited foods, such as milk and milk products, and green vegetables, were shipped regularly for sale in various markets. A considerable proportion of these foods, especially of milk and butter, went to markets in cities outside Kansas and thus went through the channels of interstate commerce. The sanitary conditions of these homes from which foods were shipped averaged about the same as those at the country homes generally in the county.

Schools and churches.—Ninety-six schools and 35 churches were inspected, a total of 131. At 98 of these schools and churches the general cleanliness was recorded as good, at 30 fair, at 3 poor. In 41 instances there was no source of water supply on the premises. In 35 cases the water supply was obtained from wells, in 41 from cisterns, in 1 case from a spring, and in 13 cases from the public supply; 11 of the 35 wells were on a down slope from the privy and subject to pollution from privy contents, and 3 of the cisterns were so exposed to pollution.

Twelve of the schools and churches were provided with water closets, 109 had privies, and 10 had no toilets of any kind. Of the 109 privies only 1 was of sanitary type; 20 were of the insanitary open-back type, allowing access to flies, chickens, and animals; 60 were surface privies boarded up at the back to prevent access of larger animals to the contents, but not excluding flies; the rest were insanitary pit privies none of which excluded flies from the excreta.

County health administration.—The administration of the health affairs of the county rested with a board of health composed of the three county commissioners and a health officer, who was a physician and the executive officer of the board. The health officer received only a small salary for part-time service, and his duties were chiefly advisory.

SPECIAL FINDINGS IN INCORPORATED TOWNS.

Some of the detailed findings in the several principal incorporated towns and villages in the county are presented below. Upon the completion of the survey of each incorporated town a report of findings with specific recommendations was made to the town council.

Fredonia.—The public (piped) water supply, though distributed generally over the town, was, on account of its faulty physical quality, used for drinking and culinary purposes by only a small proportion of the citizens. Private wells and cisterns furnished most water used for these purposes. The public water supply was hard, and frequently its turbidity was so high that it was not fit even for the bath. It was obtained from a polluted surface stream and showed the presence of the colon bacillus usually in quantities of 1 cubic centimeter.

Of the 573 homes surveyed in this town, 287 were found to be provided with water-closets connected with the public sewerage system, 280 were found to be provided with privies, and 6 were without toilets of any kind. The sewer mains emptied into a septic tank of modern construction. The effluent from the septic tank went into a swift-flowing stream, the Fall River. Of the 280 privies none was of sanitary "A" type, 11 were "B" type, 38 "C" type, 179 "D" type, and 52 "E" type. The scavenging of the privies was infrequent, inadequate, and grossly faulty. The privy contents were hauled out of town in open carts and dumped in convenient places. Except for the insanitary privies, the general cleanliness and upkeep of the premises averaged good.

The three principal dairies furnishing the milk supply presented faulty conditions, both in equipment and in methods of handling the milk. The scores given the three dairies were 27, 34, and 62, respectively.

Commercially, the town appeared progressive. The Fredonia Commercial Club was well organized and active, and appeared to be doing much for the business interests and for the development of good civic spirit throughout the county.

Neodesha.—The public water supply was distributed generally throughout the town. This water was subjected to filtration at a mechanical filter plant. The filtration, though removing most of the turbidity, was inefficient from a sanitary standpoint, and the water showed the presence of colon bacilli usually in 10 cubic centimeters. At a considerable proportion of the homes water from private wells or cisterns was used instead of that from the public supply.

Of the 800 homes surveyed in the town, 642 were provided with water-closets connected with the public sewerage system, 155 with privies, and 3 had no toilet of any kind. Of the 155 privies none was sanitary "A" type, 2 were "B" type, 80 "C" type, 44 "D" type, and 29 "E" type. The scavenging of the privies was inadequate and faulty.

Except for the privies, the general cleanliness and upkeep of the town premises were good.

Altoona.—The public water supply, distributed to about one-half of the town's area, was obtained from a polluted stream. It was not subjected to purification process and was faulty from both a sanitary and a physical standpoint. Consequently practically at all of the homes water from wells or cisterns was used.

Of the 442 homes surveyed in this town, 7 had water-closets which discharged into insanitary cesspools, 428 had privies, and at 7 there were no toilets of any kind. Of the 428 privies, 3 were sanitary "A" type, 13 "B" type, 81 "C" type, 222 "D" type, and 109 were "E" type. There was no public scavenger service to clean the privies. This work was left to individuals and was seriously neglected. The privies as a rule were cleaned only when they became filled to a point to make their use impracticable. Extensive deposits of privy contents were found along the bank of the river in the town. The drainage of the town was poor and the accumulations of water mixed with privy contents made the condition of alleys and back yards obviously very bad.

The general cleanliness of the town was poor.

At a smelter plant, in North Altoona, at which 225 men were employed, no toilet facilities were provided. The employees had to resort to convenient places of privacy afforded them by the slag piles about the plant.

From a cement plant with 25 houses, also located in North Altoona, the sewage was carried away by a sewer which emptied into the Verdigris River at a point about 2 miles upstream from the intake pipe for Altoona's public water supply.

Altoona had the reputation throughout the county of being a place in which sanitation was seriously needed.

Buffalo.—This town had no public water supply nor sewerage system. Of the 190 homes, wells furnished water to 101, cisterns to 73, and both wells and cisterns to 16. Most of the wells were of the dug type equipped with bucket and chain, and were obviously polluted from near-by privies.

One hundred and eighty-nine homes had prives and one had no toilet. Of the 189 privies found in use, 3 were sanitary "A" type, 3 were "B" type, 126 were "C" type, 48 were "D" type, and 9 were "E" type. The scavenging of the privies was inadequate and faulty. The combination of privies and wells made the sanitary conditions in this town very bad.

Buffville.—Buffville is an industrial settlement supported by the brickmaking industry and is located about 2 miles south of Altoona. There were in this town 65 houses owned by the brick company and rented by employees in the brick yard. The houses were well constructed and the premises clean. The type of toilet was the same for each house. It consisted of a closet poorly fitted over a vault walled loosely with brick.

Most of the homes were provided with cisterns, but practically all the drinking water used in the town was obtained from a properly located and properly constructed well, which furnished water found to be consistently of good sanitary quality.

TYPHOID FEVER PREVALENCE.

In the decade 1905 to 1915, the average number of deaths annually from typhoid fever in the county recorded in the course of the canvass was 7.7.

This figure is probably somewhat below the actual number which occurred. Mortality statistics for the county were available from the records of the State board of health for the years subsequent to 1911.

According to those statistics the number of deaths from typhoid fever reported from Wilson County in 1912, 1913, and 1914 was 4, 9, and 7, respectively, a total of 20. The aggregate number for these three years, according to the results of the canvass, was 16. Taking the number reported to the State board of health as more nearly the actual, the annual death rate from typhoid fever for the county in this period of three years, before the survey, was 33 per 100,000 of population. The period of highest prevalence was usually that composed by the three months, July, August, and September.

Complete morbidity statistics were not available, but of 15,215 persons enumerated in the canvass of the county, 590, or 3.87 per cent, gave a history of having had typhoid fever sometime, and 51, or 0.33 per cent, gave a history of having had typhoid fever in the calendar year 1914.

According to the evidence obtained from the canvass and survey, the chief foci of typhoid infection in the county had been the towns and villages. If these population centers could be made strictly sanitary, it appeared probable that typhoid fever in Wilson county would be reduced by over 75 per cent.

SANITARY MEASURES RECOMMENDED.

For the country homes the sanitary measures specially recommended were (1) sanitary disposal of human excreta, (2) protection of water supplies from potentially dangerous pollution, (3) systematic scattering or proper storage of stable manure to prevent fly breeding, and (4) prompt bedside prophylaxis in cases of infectious disease.

For the towns the measures particularly stressed were (1) systematic and thorough cleaning of privies, (2) reconstruction of privies to make them of sanitary type, (3) abolishment of privies in sewered areas and installation of water-closets properly connected with the sewerage system in their stead, (4) installation or extension of sewerage systems as rapidly as practicable, (5) adequate purification of public water supplies, and (6) abolishment of polluted wells and cisterns as rapidly as installations or extensions of public systems delivering water of good sanitary quality made possible.

Toward the end of the survey a recommendation strongly urged before the county commissioners was the appointment of a whole-time county health officer. This recommendation, though discussed with interest, was not acted upon favorably. "Economy" was given as the reason for postponement.

COOPERATION.

Good cooperation in the work was received from the State board of health, the county health officer, the officials of the different incorporated towns, the local newspapers, the Fredonia, the Neodesha, the Altoona, and the Buffalo commercial clubs, the practicing physicians, the clergymen, and the prominent individual citizens generally. The State board of health furnished, for a part of the survey period, two men for the regular force engaged in the detailed work, and had made in the State laboratory bacteriological examination of specimens of water and of other material sent from the county. The secretary of the State board and the State epidemiologist visited the county on several occasions to advise with the officers making the survey, to help give publicity to the work, to address public meetings and otherwise to help in every way possible.

The local newspapers gave excellent publicity to the work and editorially strongly supported the program of sanitation.

The Fredonia Commercial Club thoroughly and ably supported the work from its inception. Through the active and remarkably efficient work of this club the success of the celebration of the sanitary survey on "Wilson County sanitation day," October 5, 1915, was made possible.

WILSON COUNTY SANITATION DAY.

On September 20 a widespread movement was inaugurated with the purpose in view of having on Tuesday, October 5, at Fredonia, a celebration of the sanitary work in Wilson County. An immense feature parade (figs. 36, 37), public speaking, musical and other entertainments were planned. This movement was initiated at a specially called meeting of the Fredonia Commercial Club. At this meeting, having, it was said, the largest attendance ever recorded in the history of the club, committees on "parade," "decoration," "advertising," and "reception" were appointed, and all expenses to be incurred for the realization of the plans outlined were guaranteed by the many prominent business men present.

Full-length, three-column front-page articles concerning the event were duly featured in the local newspapers and, to a lesser extent, in other newspapers throughout the State. Large and small posters and varicolored handbills announcing the most salient features of the program were circulated throughout the county by the committee on advertising. The advertising of the preparations for "Wilson County sanitation day" furnished to the citizens of the county generally, and to those of Fredonia and its immediate vicinity particularly, a strong incentive to hasten the completion of sanitary work which was in progress or contemplated.

"Sanitation day," October 5, was declared a holiday. All schools and all places of business in the county which could suspend operations were to be closed on that day. All available accommodations at the hotels in Fredonia were reserved for the guests of the town. The secretary of the State board of health changed the place of the quarterly meeting of the State health officers from Kansas City to Fredonia in order that these officials might attend the celebration. Representatives of the commercial clubs of the nine counties forming the Southeast Kansas Federation accepted an invitation from the president of the Fredonia Commercial Club to meet in Fredonia on October 5.

Asst. Surg. H. C. Yarbrough, the officer in immediate charge of the sanitary survey of Wilson County, was chief advisor in the preparations for the celebration. The following is from a report which he made of the event:

"Estimates by representatives of the Associated Press in Fredonia on the eventful day placed the number of people in Fredonia to attend the celebration at 7,500, or over one-third the entire population of the county. The weather was clear and fine.

"The parade was roughly divided into five sections—the executive quota, State, county, and town officials, including the governor of the State; the health quota, United States, State, county, and town health officers; the commercial quota, representative members of the commercial clubs of Wilson and the nine other counties forming the Southeast Kansas Federation; the citizenry quota, prominent and influential citizens of the county interested in the health and welfare; and, lastly, the floats."

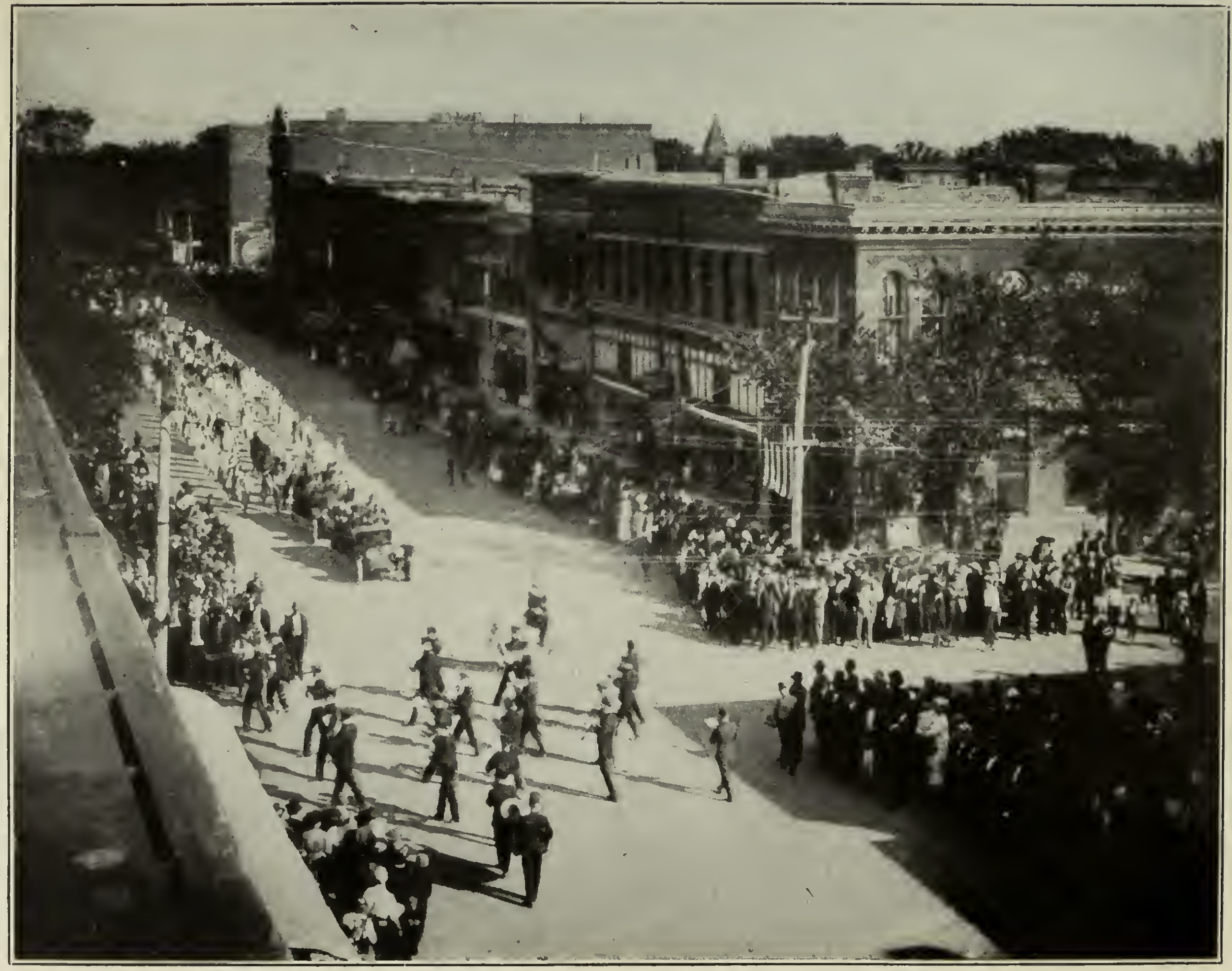


Fig. 36.—Head of street parade in sanitation celebration at Fredonia, Kans.

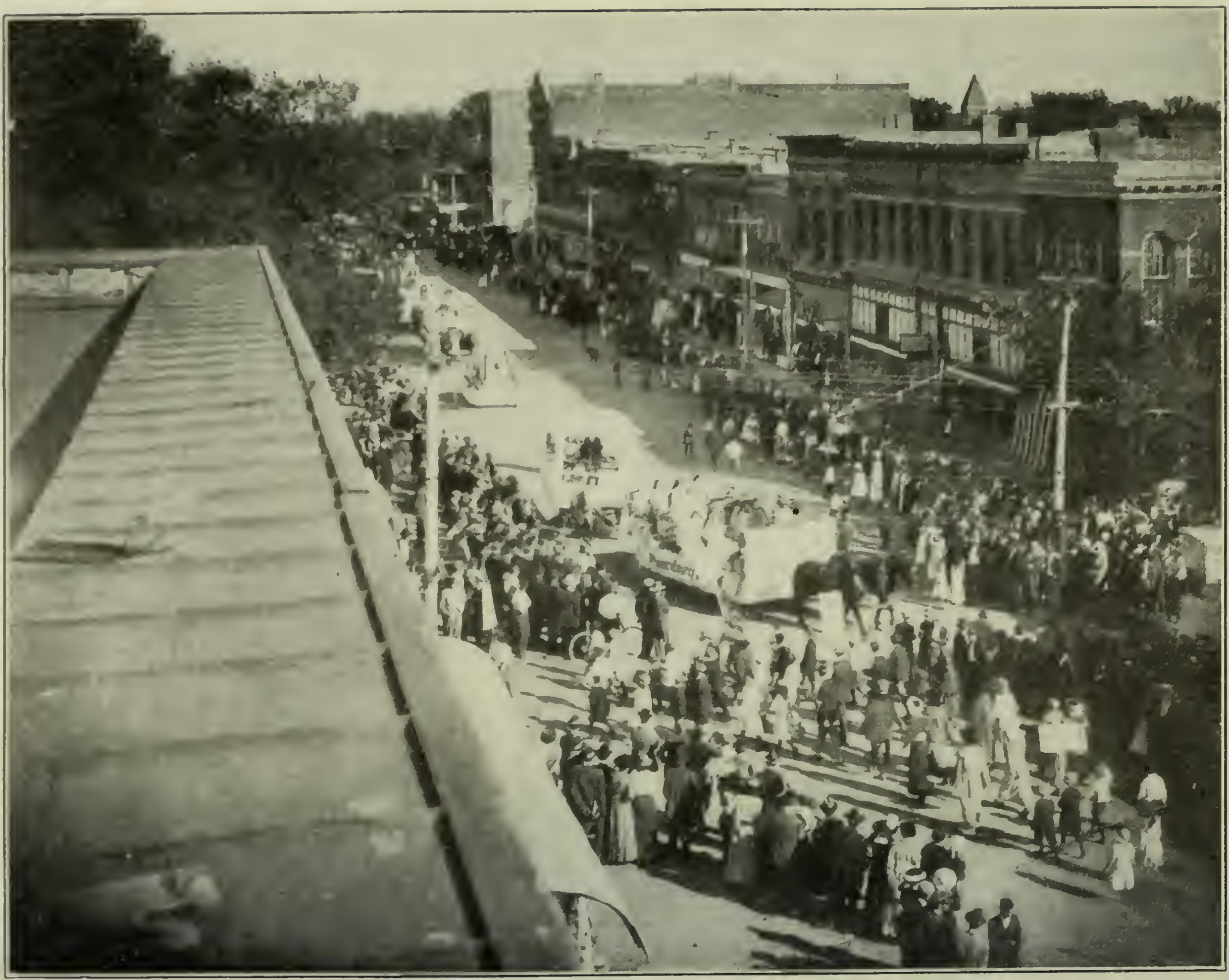


Fig. 37.—Section of parade at Fredonia on Wilson County sanitation day.

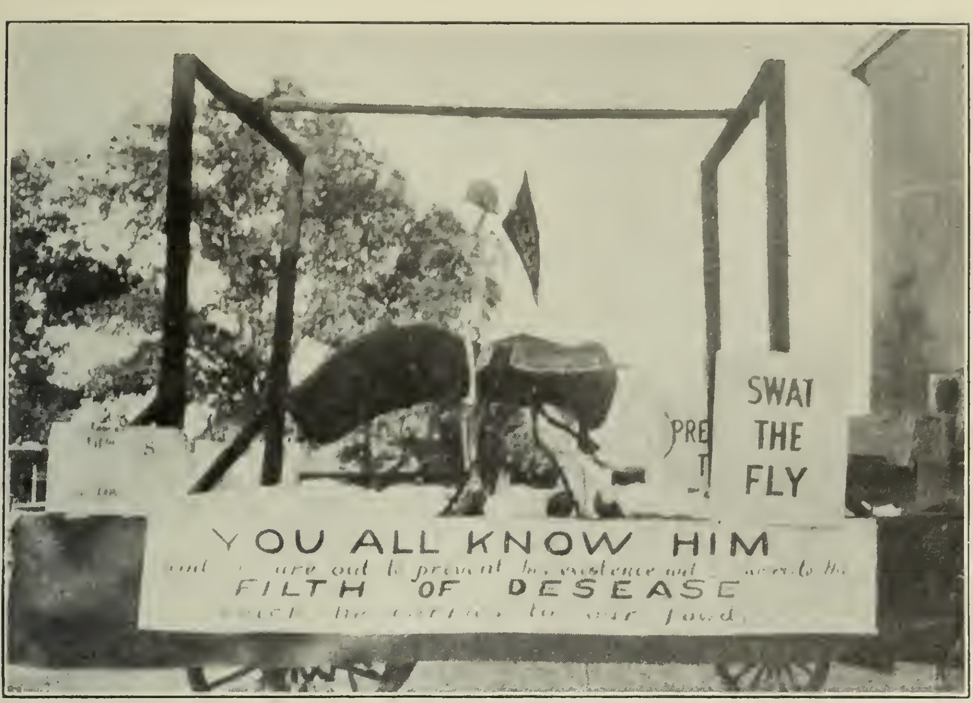


Fig. 38.—A feature of sanitation parade at Fredonia, Kans.

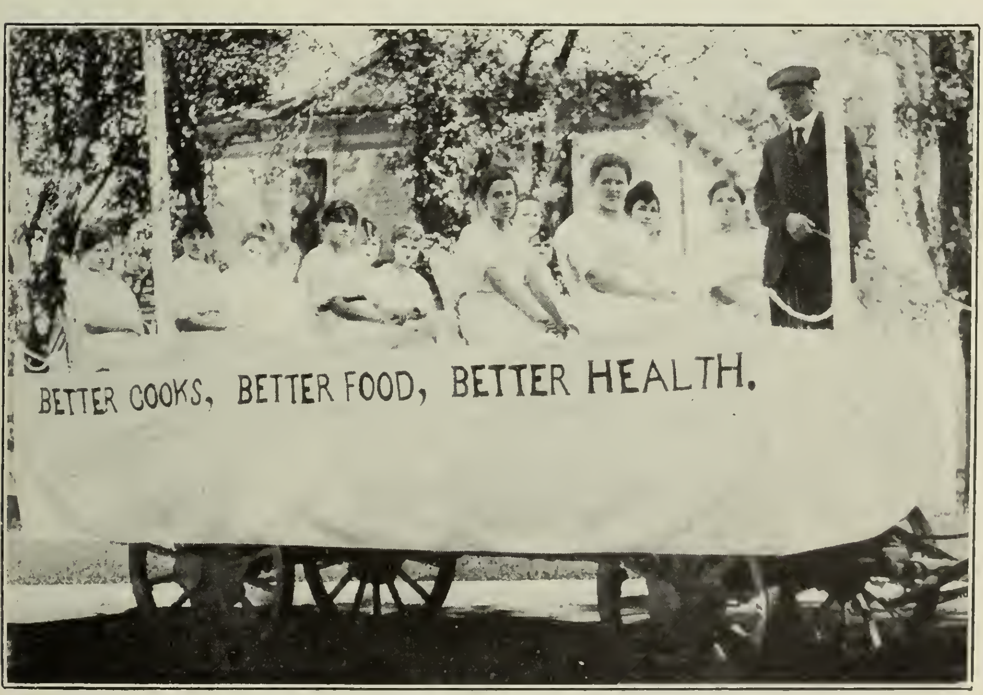

BETTER COOKS, BETTER FOOD, BETTER HEALTH.

Fig. 39.—A feature of sanitation parade at Fredonia, Kans.

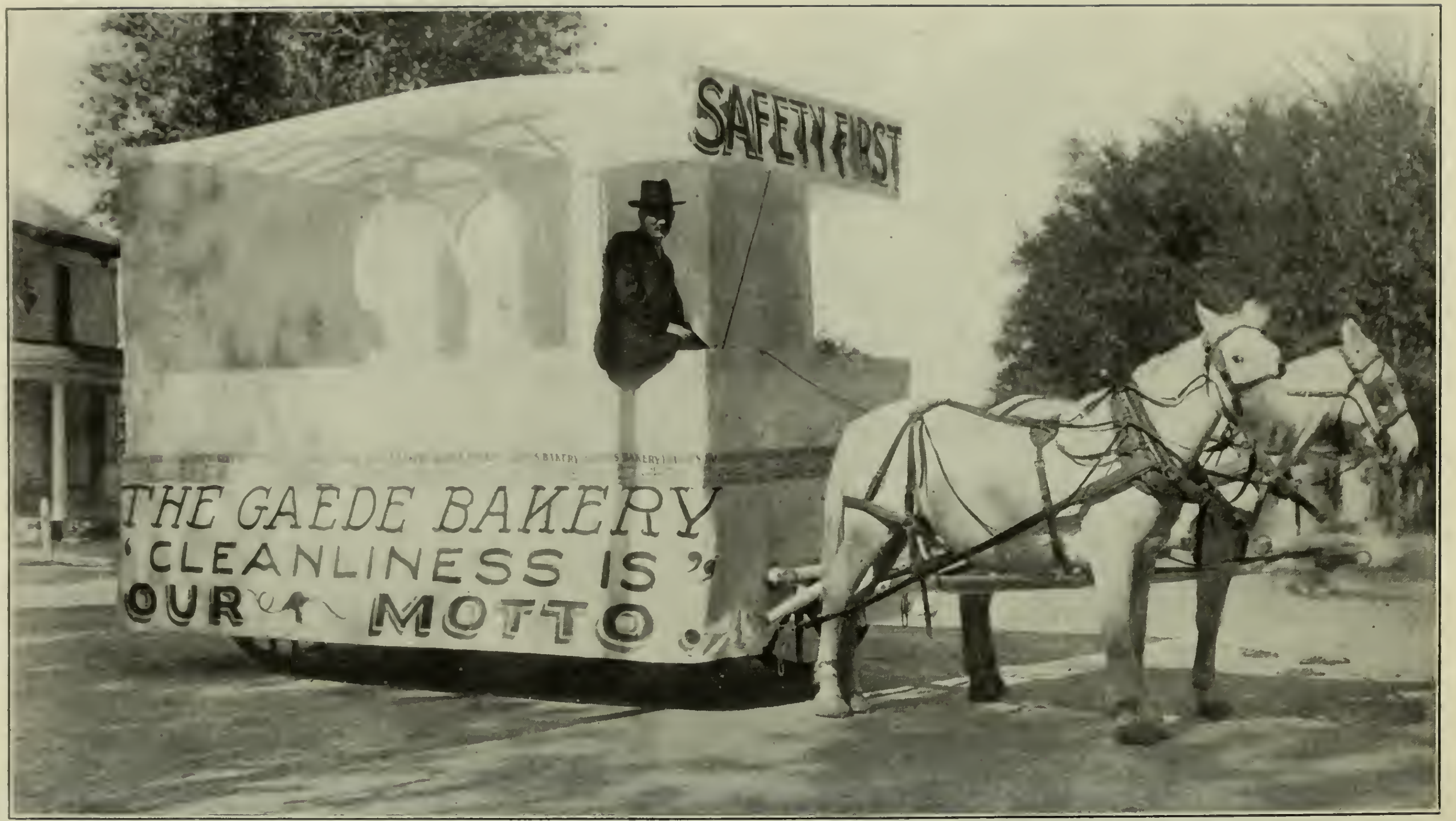


Fig. 40.—A feature of sanitation parade at Fredonia, Kans.

The handbills outlining the order of the parade were as follows:

Official Line of Parade.

WILSON COUNTY SANITATION DAY.

At Fredonia, Tuesday, October 5, 1915.

SECTION "A" (SPENCER).

The Grand Marshal.
1. The City Marshals, mounted on horses.
2. Independence City Band, on foot.
3. First Platoon of Company E, First Kansas Infantry.
4. Governor of Kansas, the four mayors of Fredonia, Neodesha, Altoona, and Buffalo, respectively, in Coleman's seven-passenger auto.
5. Second Platoon of Company E, First Kansas Infantry.
6. United States Senators and Congressmen, State Senators and Representatives.
7. The three County Commissioners in auto No. 1; other county officials in auto No. 2.
8. City Commissioners of Fredonia, auto No. 3.
9. City Commissioners of Neodesha, auto No. 4.
10. City Commissioners of Altoona, auto No. 5.
11. City Commissioners of Buffalo, auto No. 6.

SECTION "B" (KENNEDY).

12. Fredonia City Band, on foot.
13. Fredonia and State Officials, from Washington, D. C., and Topeka, Kans., auto No. 7.
14. Government Officials of Wilson County Survey, auto No. 8.
15. Four members of State Board of Health, auto No. 9.
16. Four members of State Board of Health, auto No. 10.
17. Four members of State Board of Health, auto No. 11.
18. Four members of State Board of Health, auto No. 12.
19. Two members of State Board of Health, auto No. 13.
20. City Health Officers, Fredonia, Neodesha, Altoona, and Buffalo, auto No. 4.
21. President, Vice President, Secretary and Treasurer of the Commercial Club of Fredonia, auto No. 15.
22. Same Officials of Neodesha Commercial Club, auto No. 16.
23. Same Officials of Altoona Commercial Club, auto No. 17.
24. Same Officials of Buffalo Commercial Club, auto No. 18.
25. Four delegates from the nine counties representing the Southeastern Kansas Federation of Commercial Clubs, auto No. 19.
26. Four delegates as per preceding, auto No. 20.
27. Four delegates as per preceding, auto No. 21.
28. Four delegates as per preceding, auto No. 22.
29. Four delegates as per preceding, auto No. 23.

SECTION "C" (STRYKER).

30. Neodesha City Band, on foot.
31. Two hundred of the progressive citizens of Wilson County, marching four abreast.
32. County School Officials, auto No. 24.
33. Line of 1,500 school children divided according to districts, and each district carrying appropriate banner.

SECTION "D" (LOCKARD).

34. Float A: Typhoid fever victim and lord high executioner.
35. Float B: Immense fly mounted by skeleton on carpet of dead infants, life-sized dolls shrouded.
36. Float C: Empty baby carriages, 13 drawn by preceding float.
37. Float D: Thirteen healthy infants and mothers inside auto truck, auto No. 25.

38. Float E: Representing School of Domestic Science.
39. Float F: By State Health Department.
40. Float G: By State Health Department.
41. Float H: By County Health Officials.
42. Float I: By Local Government Officials.
43. Float J: By Gaede Bakery.
44. Float K: By Singleton Supply Co.
45. Float L: By Cantrall & Wolever.
46. Float M: By Miller Bros. Meat Market.
47. Float N: By Metropolitan Life Insurance Co.
48. Float O: By Pierce & Coleman.
49. Float P: By Butin Bros.
50. Float Q: By Swartz Grocery Co.
51. Float R: By S. G. Clark Grocery Co.
52. Float S: By Fredonia Portland Cement Co.
53. Float T: By Schloesser Furniture Co.
54. Float U: By City Drug Store.
55. Float V: By Wilson County Bank.
56. Float W: By Hess & Kisor.

SECTION "E" (VAN DUSER).

57. Buffalo City Band, on foot.
58. Float X: By Shearer & Crom.
59. Float Y: By Ira Wilson.
60. Float Z: By Shearer, Crum & Wilson.
Representatives of Associated Press.
Motion Picture Machine Operators.

"In addition to those on foot, viz, the militia, the three bands and the 1,500 school children, there were 72 vehicles in the parade. Forty-two of these vehicles were motor cars in which rode the various officials and other men prominent in public affairs. The remaining 30 vehicles were floats. These floats were designed with the object in view of making them interesting as well as instructive. They represented a great deal of care and effort on the part of those who planned and constructed them.

"Some of the floats of especial interest were as follows:

"Float A consisted of a horse-drawn wagon upon which was mounted a broad flat platform. This platform was draped in black, and in the center of it was constructed a hangman's scaffold. In the center of the scaffold stood seven shrouded silent subjects 'doomed to die.' There was a heavy noose around the neck of each victim, and the swing rope from each noose was thrown up and over the arm of the scaffold, finally descending to be gathered into the powerful hands of the demon 'Typhoid.' The last-named was set forth in effigy by a large, awe-inspiring figure draped in the black palludament of death. This float depicted the fate of the unlucky seven; that is, the average number dying each year in Wilson County of typhoid fever. The float was accordingly designated with a white muslin runner on each side of the wagon and appropriately inscribed.

"Float B was also a horse-drawn wagon upon which was placed a large platform. Mounted on the platform was the model of an immense house fly. Riding astride this fly was a real skeleton carrying his official flag 'the disease pennant.' Lying trampled beneath the huge feet of the fly were the 13 infants which die annually in Wilson County of preventable, fly-borne disease. The infants were represented by 13 life-sized dolls draped in white. The float was labeled with such placards as: 'Prevent the Fly,' 'Swat the Fly,' 'This is Him,' 'Death's Messenger,' 'You Know What He Eats and Where He Eats, Does He Also Eat at Your Table?' 'You All know Him, and We are Out to Prevent His Access to the Filth of Disease Which He Brings to Our Food' (fig. 38).

"Float C was represented by 13 empty baby carriages towed by a rope attached to Float B. Thus was portrayed the number of baby carriages emptied in the county each year by the fly-borne diseases common in the summer months.

"Float D, as an illustration of what could be realized if sufficient effort were made by the people and as a pleasant contrast to Float C, was a large appropriately decorated conveyance in which rode 13 healthy infants and their happy mothers.

"Float E, furnished by the School of Domestic Science, carried 12 young ladies becomingly attired in white. On each side of the float was a legend: 'Better Cooks, Better Food, Better Health' (fig. 39).

"Float F, large model of a septic tank, made of grayish-white colored beaver board to imitate cement. The tank set forth every practical detail of the finished septic tank. It consisted of two interior compartments separated, or rather formed, by a thick division board across the tank at the junction of the first third of the length of the tank with the second third. The required plumbing was also set in place. Inside the tank were descriptive booklets giving specifications in detail and estimated costs.

"The tank, immediately after the parade, was placed on the sidewalk in a conspicuous place, where it could be more advantageously inspected by the interested citizens.

"Float H depicted a faulty water supply. It consisted of a horse-drawn wagon with a broad platform on which stood the usual type of surface well. The well had a pump, which was operated by a boy. The water was seen coming from the spout of the pump, overflowing the bucket and washing over the boy's dirty feet and carrying other filth into the well through the leaky top covering the well and supporting the pump.

"Float I was an ordinary two-horse wagon, loaded high with 10-gallon galvanized iron cans, such as are used in sanitary privies. Fastened to each side of the wagon body was a white muslin runner on which was painted the significant legend: 'Who put the "Kans" in Kansas?'

"Float J was a modern bakery setting. The bakers were clothed in spotless white clothes, and from behind the walls of white netting threw continually handfuls of securely and sanitarily wrapped caramels, especially intended for the spectators (fig. 40).

"The majority of the succeeding floats were chiefly of commercial interest. The last two of these in the parade were of special interest from a standpoint of arousing the people to thoughtful consideration. Float X was a large black hearse, through the glass sides of which could be seen a large model of typhoid bacillus. The model was approximately designated, and it was further made to appear that this was the remains of the typhoid seed which we wished to bury forever in a place from which he could never rise again. The pallbearers of this funeral were the tombstone makers, while the chief mourners were the local undertakers who rode in assumed utter dejection in a somewhat dilapidated car immediately following the hearse. On the side of the car was the sign, 'Undertakers,' while hanging across the back of the car was a placard, 'Regardless of business, we take pleasure in attending the funeral of our most undesirable partner.' 'Look Out! We'll Get You Sooner or Later. Listen to the Health Officers If You Would Like It To Be Later.' Tied on to the rear of the float was a toy wagon in which rode a doll dressed in khaki suit with a cap. The 'little officer' held in his hand the usual type of fly swatter. In turn, fastened to the rear of the baby cart was a model of the scavenger man, obviously following along to take care of the flies falling a victim to the mighty weapon of the little soldier of sanitation.

"This last, as well as the many other novel features of the immense parade, must necessarily have been seen to be fully appreciated.

"The parade was held immediately after lunch, about 1.30 p. m. The line of march was along the main streets of the town. The distance from the point of start to the point of finish was 2½ miles. A comprehensive idea of the length of the procession is afforded by the fact that the head of the procession passed the finishing or disbanding point just as the last two vehicles at the tail of the parade wheeled into line at the starting point.

"The forenoon and a part of the afternoon were devoted to public speaking and band concerts. The principal speakers of the day were Gov. Arthur Capper, of Kansas; Congressman Phil Campbell; State Senator Ben Paulen; and Surg. L. L. Lumsden.

"The addresses were delivered from a patriotically decorated stand constructed at the main entrance to the courthouse. The vast audience attending the public speaking found ample accommodations on the spacious courthouse grounds.

"The splendidly appointed rooms of the commercial club were kept open and refreshments served throughout the day to the many out-of-town guests present. The day was acknowledged on all sides as being a complete success in every way."

"Wilson County sanitation day" was given much publicity in the newspapers of Kansas generally and through the Associated Press in many metropolitan journals in other States."

RESULTS.

Country homes.—Subsequent to the first round of visits to the country homes, endeavor was made to ascertain to what extent the suggestions made by the investigators were being carried out. Letters were mailed to about 1,000 families at whose homes the water supply had been found faulty or the method of excreta disposal had been found dangerous. From among the several hundred replies stating that the improvement had been made 100 homes were selected for a revisit to determine the accuracy of the returns from the follow-up letters. Besides this plan of "follow-up" work, 50 representative homes in each of four widely separated neighborhoods were revisited in September and October, with a view of determining the average sanitary improvement of all the country homes since the first round of survey.

From the findings at the 100 homes circularized with letters and those at the 200 homes distributed in the four neighborhoods it was estimated (1) that marked improvement in water supply had been made at 30 per cent of the country homes, and (2) that definite and either efficient or nearly efficient improvements had been made in the method of disposal of human excreta at 22 per cent of the country homes, including 8.84 per cent of the homes at which sanitary "A" type privies had been installed.

Towns.—Marked advancement in sanitation was made in all the towns and villages in the county. Much work in the towns was in progress when the survey terminated.

Soon after the first round of survey of the towns the respective councils of Fredonia, Neodesha, Altoona, and Buffalo passed ordinances requiring the abolishment of insanitary privies and the installation of either sanitary water-closets or of sanitary privies in their stead. Each of these towns also made provision for the operation of an adequate scavenger service.

Of 1,135 town homes at which on the original survey the practice of grossly insanitary methods of excreta disposal was found, at 793, or 69.87 per cent, either sanitary water-closets or sanitary privies were installed by the end of the survey period.

Fredonia.—On the first round of survey of this town it was found that at a large proportion of the homes an ordinance, already in effect, requiring sewer connection of all dwellings on sewer lines had been complied with only to a very limited extent. As an apparent result of the educational influence of the survey, at over 50 per cent of the homes not connected with the sewer, water-closets connected with the sewerage system were installed. Thus 122 privies were abolished. In addition to the 122 privies so abolished, about 100 insanitary privies were converted into sanitary "A" type privies. At the end of the survey in October, the 64 insanitary type privies remaining of the 280 found on the first inspection of the town had been cleaned and disinfected preparatory to the installation of cans and the carpentering to make them of sanitary type. An efficient scavenger service was established and operated by the municipal authorities to keep the privies clean. As frequently as necessary the cans were removed from the privies, hauled to the septic tank, emptied, cleaned, treated with disinfectant solution, and then returned for use in the privies. To supervise the scavenger work and to make frequent inspection of privies the town council appointed an efficient whole-time sanitary inspector.

Early in the summer a plant was installed and put into operation for the treatment of the public water supply with hypochlorite of lime. Thus the water was made of reasonably safe sanitary quality. At the end of the survey a filtration and water-softening plant, at a contract cost of $80,000, was being installed.

At one of the three principal dairies furnishing the town with milk the improvements recommended were carried out. To meet the cost of additional equipment the dairyman operating this plant raised the price on the milk which he offered for sale. Notwithstanding his somewhat higher price for milk, his business markedly increased immediately following the sanitary improvements at his dairy. This appeared to be a substantial indication of the attitude of the citizens of Fredonia toward sanitary methods.

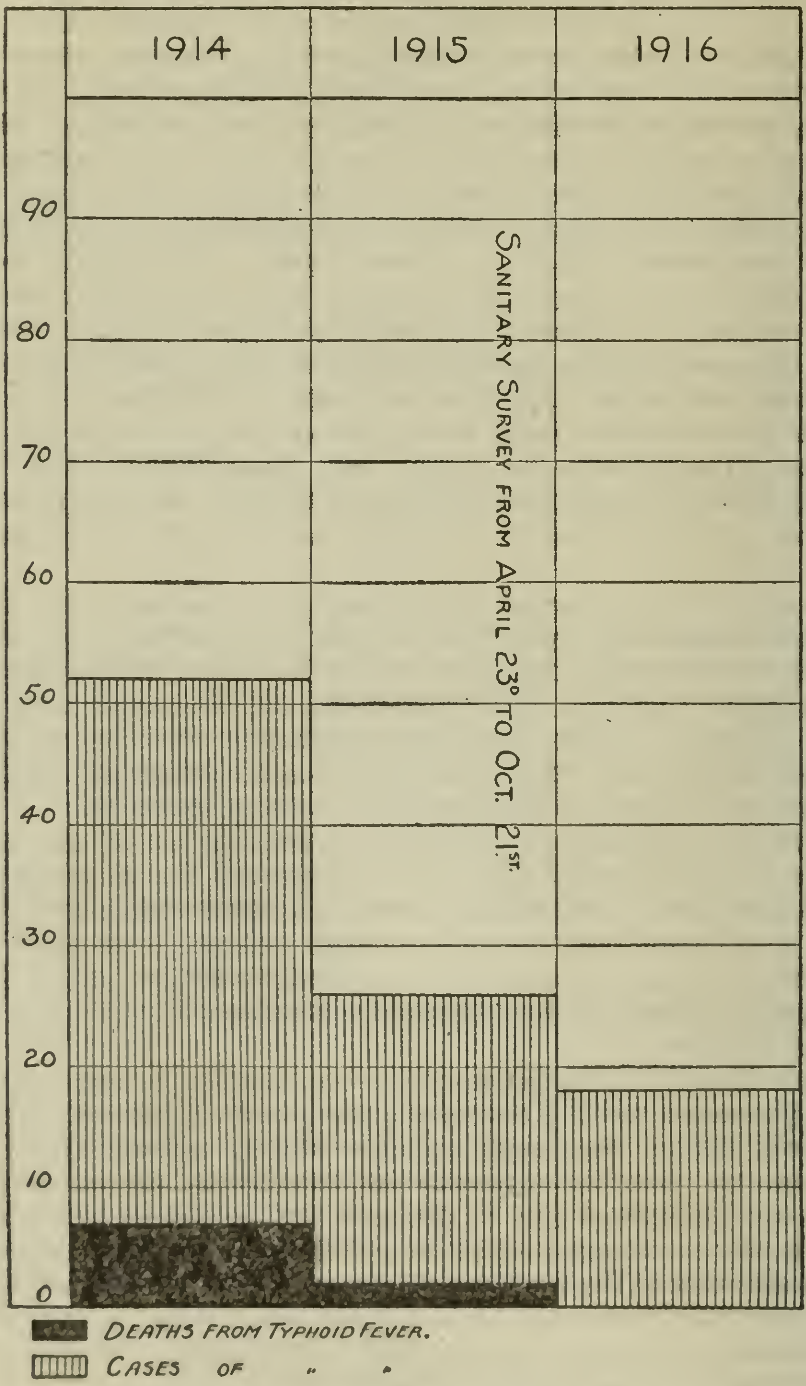
Neodesha.—As a result of the survey practically all of the privies were cleaned and disinfected and 37 were abolished with the installation of water-closets in their stead. On October 1, 679 of the 800 dwellings in this town were provided with either water-closets or sanitary privies. Steps were being taken toward the installation of a municipal septic tank for the proper treatment of sewage, and an apparatus for the chlorine treatment of the city water supply was being installed.

Altoona.—A rapid investigation of the conditions in Altoona at the close of the survey revealed the fact that of the 439 insanitary privies originally found in the town, 423 had been made over into strictly sanitary type. The mayor of this town had enforced vigorously and intelligently the sanitary ordinance. Since the reports showed only 16 disposals still unaffected by the influence of the survey, the percentage of effective sanitation in respect to excreta disposal at the termination of the work was 96 per cent, with a very promising outlook for complete sanitation of the town within a short time. A chlorine plant for the treatment of the public water supply was installed. The general cleanliness of the town was improved to a high degree.

The remarkable change in the sanitary status of Altoona excited much favorable comment among the farmers visiting and trading in the town. The influence of the work in Altoona appeared to reach the country neighborhoods.

In the follow-up work conducted in the townships, the highest percentages in sanitary improvement were noted in townships in the vicinity of Altoona. Altoona at the beginning of the survey period had the lowest sanitary rating given the towns in the county. At the end of the survey period this town stood at the head of the list of the towns in having the highest sanitary rating. This result was a source of pride to the citizens of the town and furnished an example of what can be accomplished in small towns fortunate enough to have at the head of the town government men who can understand and who will support intelligently a reasonable program of sanitation.

CHART 10:—TYPHOID FEVER REDUCTION FOLLOWING SANITARY SURVEY IN WILSON COUNTY, KANSAS.



Buffalo.—Forty-six of the 187 insanitary privies had been converted into sanitary "A" type, and the work was still in progress at the end of the survey.

Buffville.—All of the 65 insanitary privies in this town were converted into sanitary type. A systematic and efficient scavenger service was established. On all sanitary points this industrial settlement scored high at the end of the survey.

Industrial settlements.—At the several industrial settlements besides Buffville, in the county, practically all of the suggestions made for sanitary improvements were carried out.

Typhoid fever reduction.—According to all evidence which could be obtained, the rate of prevalence of typhoid fever and of other diseases which result from filth-borne infection was much less for the summer and fall season of 1915 than for the corresponding seasons of previous years. In the seven-month period, June 1 to December 1 of 1914, when the returns were obviously incomplete, 40 cases were recorded, while in the corresponding period of 1915, the year of the survey, when the returns appeared complete, only 16 cases were recorded. (Chart 10.)

SUBSEQUENT PROGRESS.

A resurvey of this county has not been practicable, but, according to reports received, progress in sanitation in the county—particularly in respect to sewer extensions and water-closet installations in the towns—has continued.

The following is an excerpt from a letter, dated March 26, 1917, from the secretary of the State Board of Health of Kansas:

> I am sure you will be interested in what appears to be the result or effect of the survey made in Wilson County in the incidence and mortality of typhoid fever.
>
> The year (1914) before the survey, there were 52 cases of typhoid fever, with 7 deaths; the following year (1915, the year of the survey), there were 26 cases, with 2 deaths; the last year, 1916, there were 18 cases and no deaths.
>
> This last year's record has been made despite an increase in the incidence of the disease throughout the State and an increase in the mortality rate over 1915.
>
> I think that this good showing may be fairly attributed to the intensive work done in Wilson County by your service in cooperation with the State board of health.

SANITARY SURVEY OF ORANGE COUNTY, N. C.

Orange County, N. C., was selected as one of the counties for the survey in 1915 (1) because it appeared to present sanitary, economic, and social conditions fairly representative of the State as a whole, and (2) because of the interest manifested in and desire expressed for the work by local officials, civic organizations, and prominent citizens generally.

The request for the sanitary survey of this county was initiated by the North Carolina Club of the State university and was indorsed by the State board of health, the county commissioners, the county board of education, and the mayors and councils of the three incorporated towns.

On March 1, 1915, the county commissioners unanimously adopted the following resolution:

> We the board of commissioners of Orange County, being greatly interested in the sanitation survey of our county, do respectfully ask Dr. W. S. Rankin, secretary State board of health, to present our county to the favorable consideration of Surg. Gen. Blue for a survey by the United States Public Health Service. And we furthermore put ourselves on record as favoring unanimously a whole-time health officer as soon as conditions will permit.

Thus the prospects appeared good to have, as one of the results of a survey of this county, the addition of Orange to the list of counties in North Carolina having whole-time county health officers.

The survey was begun May 1, 1915, and terminated November 6, 1915.

GENERAL CONDITIONS.

Orange County is situated in the northeastern part of the middle third of North Carolina, in what is designated the Piedmont section of the State. The average elevation is 600 feet above sea level. The county is crossed 7 miles south of its center by the 36° north latitude, and lies between the 79° and 79° 15′ meridians west longitude. The county has an average width of 14 miles, the eastern and western boundaries being nearly straight lines, but converging slightly to the south. The length of the county from north to south is 28 miles. The area is 390 square miles. The county is drained by several small streams, the largest of which are the Eno River and the North Branch of Little River, both streams forming tributaries to the Neuse River. A considerable section of the county, including the town of Hillsboro, is on the watershed of the Eno River, which is the source of water supply for the city of Durham. The general direction of the drainage is southeasterly.

The soil formation is generally clay. Sandy stretches are found in the northwestern sections.

The Greensboro-Goldsboro branch of the Southern Railroad crosses the middle of the county from east to west, touching Hillsboro. A spur line starting at a junction 2 miles west of the eastern border of the county, runs south to Carrboro and Chapel Hill, a distance of 11 miles.

Orange County is divided into seven townships. The county seat, Hillsboro, is situated near the center of the county, in the township of the same name. Hillsboro, Carrboro, and Chapel Hill constitute the incorporated towns of the county. Hillsboro has a population of 878, and has 223 homes. Carrboro has a population of 784, with 193 homes. The population of Carrboro is made up almost exclusively of cotton and woolen mill operatives with their families. Chapel Hill, the seat of the University of North Carolina, has a population of 1,382, and has 347 homes, including 12 dormitories for 1,000 students at the university.

The population of Orange County, according to the United States census of 1910, was 15,064, including the resident students at Chapel Hill. About 28 per cent of the population are colored. The head of only one family was of foreign birth.

Eighty-five per cent of the area of the county is called farm land, but only 31 per cent was in cultivation. The average farm acreage is given as 107, with but one-third under improvement. For the whole county, 76,980 acres are improved and 120,660 acres are wooded. The value of farm lands in 1910 was $1,721,938, while the value of farms, including stock, buildings, and implements, was $3,293,748. The average farm was valued at $1,674, while the average land value per acre was given as $8.17.

Sixty-two per cent of all farms were worked by owners, 38 per cent by tenants; 14.2 per cent of the farms cultivated by owners were mortgaged.

The live stock and poultry on farms were valued at $539,495.

The population is distributed per square mile as follows:

Whole county: Families per square mile, 8; total inhabitants per square mile, 38.6.

Rural section: Families per square mile, 6; total inhabitants per square mile, 27.4.

Six hundred and thirty-five farmers employ farm labor at a cost of $45,666 a year. One thousand seven hundred and thirty-one farms use commercial fertilizer costing annually $65,000. Two hundred and eighty-four farms purchase feed for stock costing $7,881, while the yield of other farms from the sale of stock feed is $26,810.

The value of total annual crop for the county is given as $1,100,103. This value is obtained from a diversified crop. Corn leads, with the greatest acreage and a production of 339,069 bushels. Wheat is second, with a crop of 79,482 bushels. The total value of live-stock products was $289,445. Tobacco, with an acreage of 2,936, yielded 1,772,103 pounds. Cotton planted on 2,948 acres yielded 1,430 bales. The total value of crops and animal products was $1,300,548, in the census year 1910. The per capita wealth of the county people was $218 (based on all farm property and county population). The per capita taxable wealth in 1910 was $330 (based on the value of all property on the tax books and the entire population).

The above data on economic and industrial conditions are taken from United States census reports and from findings obtained in surveys made by the North Carolina Club of the State University.

The land is generally hilly or rolling. The public roads are for the most part unimproved.

PLAN AND SCOPE OF SANITARY SURVEY.

The work comprised (1) a canvass and sanitary survey of all the homes in the county, including country neighborhoods and towns; (2) a sanitary survey of all schoolhouses, churches, railway stations, post offices, and stores; (3) public addresses on the subject of sanitation in all sections of the county, many of these with lantern-slide illustrations; (5) distribution of literature on different phases of the subject of sanitation; (6) the founding of special organizations for the advancement of sanitation; and (7) the epidemiological investigation of cases of typhoid fever as they developed. In all six men were assigned to this work; five were furnished by the Public Health Service and one by the State board of health. July 10 two of the Public Health Service men were detached for duty in Alabama. July 10 the term of the State board appointee expired, and this man from that time to September 15 was continued on the work as a temporary appointee of the Public Health Service. The secretary of the State board of health made four visits to the county during the survey, and the officer of the Public Health Service in charge of rural sanitation studies made seven.

As a preliminary to the field work, a circular letter, signed by the Surgeon General of the Public Health Service and countersigned by the State health officer, was mailed from the office of the State board of health to all persons in Orange County whose names appeared on the tax list of the county. This letter explained the object of the studies and prepared the way for the visit of the investigator. The actual canvass was started May 4.

Headquarters were established at Hillsboro. The townships were used as units for the work. Buggies were used mainly for transportation, the roads generally not being good enough to make the use of automobiles advantageous. The men engaged in the detailed work in the townships lived in the country neighborhoods a considerable proportion of the time; but most of the work was done from Hillsboro and Chapel Hill as bases.

Besides the survey of country homes, schools, churches, stores, post offices, and railroad stations, a detailed survey, on the request of the respective town authorities, was made of each of the then incorporated towns. The canvass and survey comprised the homes in three cotton-mill villages, two located at Hillsboro and one in Carrboro.

Besides the educational work in the course of the house-to-house surveys, lectures on sanitation were presented, on request of the local citizens, at 72 public meetings. The total attendance at these meetings was 6,764 persons, giving an average attendance of 94.

The students of the University of North Carolina were given two illustrated lectures at Chapel Hill. One of these was given to those attending the regular course and the other to those attending the summer course at the university. Lectures were also delivered at the high schools of the county.

On certain special occasions during the progress of the survey opportunities were offered for reaching large numbers of the citizens at times of meetings for other purposes.

On May 4, the first day of the spring term of the circuit court, the presiding judge requested an address on sanitation for those attending the court session. This address was given by Dr. Lumsden immediately after the grand jury had been charged, at a time when the court room was well crowded.

On May 15, as part of the exercises for "community day," an address on rural sanitation was delivered by Dr. Harrington before an audience of 1,200 at Cedar Grove Village.

The Orange County Farmers' Union, at a meeting in Hillsboro, June 26, devoted its morning session to the subject of rural sanitation, and addresses were delivered by Dr. W. S. Rankin and Dr. Harrington.

On July 9 the University of North Carolina held its annual rural-life conference, and at both the afternoon and evening sessions addresses on public health and sanitation were presented by Prof. Ch. Wardell Stiles, Public Health Service; Dr. Rankin, State board of health; and Dr. Harrington.

At the Hillsboro chautauqua, September 25–29, two addresses on rural sanitation were delivered as a part of the program. In connection with this chautauqua there was in Hillsboro a parade of school children to present the interest of the school people in the subject of sanitation. All schools in the county were represented in the parade. The children carried banners bearing appropriate legends. Conspicuous among the legends were the following:

" Law compels us to attend school. We ask for health protection at school."

"Protect us against typhoid fever and hookworm disease—Build a sanitary privy at the school."

On November 6 an address on " School sanitation and the teacher's place in the education of the student in hygiene of the home " was delivered before the assembled school-teachers of the county in regular annual meeting.

The initial canvass and survey was completed on August 9. Three thousand two hundred and forty-nine homes were visited, of which number 763 were town homes. After the first round of survey was completed, the time of the investigators was devoted to supervising and studying the sanitary work being done in the towns and to making follow-up visits to country homes. One thousand one hundred and fifty-six of the country homes were revisited one or more times.

FINDINGS IN RURAL SECTIONS.

Of the 2,486 dwellings visited in the rural sections, 1,333 were occupied by the owners, 801 by tenants, and 352 were vacant. For 2,134 of the country homes full data were obtained.

Popular attitude toward the work.—Of the 2,134 homes for which data were obtained, at 563 the occupants agreed immediately to improve the sanitary conditions of their premises, and at 1,104 they showed interest but did not state they would make the improvements; only 61 seemed indifferent, and but 2 were opposed to the work. For 404 homes the attitude of the occupants was not stated.

Race.—At 1,503 homes the families were white, at 566 colored, and for 65 the race was not recorded.

Nationality.—At all except one home the head of the household was American born. The one of foreign birth was Italian.

Number in household.—The number of persons in 2,134 homes at which the number in the household was enumerated was 10,826. Thus the average for each home in the rural sections of the county was 5. There were 128 homes with more than 10 in the family.

Number of rooms to house:	Dwellings.
With 1 room	153
With 2 rooms	574
With 3 rooms	596
With 4 rooms	396
With 5 rooms	238
With 6 rooms	249
With 7 rooms	93
With 8 rooms	81
With 9 rooms	21
With 10 rooms	15
With 11 rooms	2
With 12 rooms	6
Not stated	62
Total	2, 486

Duration of residence in county.—The head of the household had lived in the county less than 1 year at 126 of the homes, from 1 to 5 years at 136, from 5 to 10 years at 160, from 10 to 20 years at 183, over 20 years at 935, and this datum was not recorded at 594.

Duration of residence at present home.—The head of the household had lived in the home occupied at the time of the survey for less than 1 year at 444 of the homes, from 1 to 5 years at 440, from 5 to 10 years at 299, from 10 to 20 years at 271, over 20 years at 539. At 141 homes this datum was not recorded.

Sale of foods.—From 29 of the homes milk, vegetables, or fruits were sold regularly.

Topography.—The premises were on flat ground for 25 of the homes, on rolling ground for 1,431, and on hilly ground for 908. For 122 premises the topography was not recorded.

Soil formation.—On 487 premises the formation of the surface soil was sand, on 1,557 clay, on 415 loam, and on 27 its character was not recorded.

General appearance of residence.—Recorded as good for 996 homes, fair for 937, poor for 539, and for 14 the appearance of the residence was not recorded.

Construction of house:

Frame	1,408
Brick	12
Log	639
Not stated	31

General cleanliness.—Recorded as good for 1,187 of the homes, fair for 775, poor for 386, and for 138 the general cleanliness was not recorded.

Cellar or basement.—Ninety-one homes had cellars, and 2,395 had none.

Screening in summer.—At 299 homes the screening of dining room and kitchen was complete, at 193 only partial, and at 1,984, or 80 per cent, there was no screening at all. For 10 homes the degree of screening was not recorded.

Animals on premises.—At 1,755 of the homes cows were kept; at 1,659, horses; at 2,019, poultry; at 1,861, hogs; at 1,385, dogs; at 1,707, cats; and at 468 no animals were kept.

Stable manure.—Of all the rural homes in the county at which animals were stabled at only one was provision made to prevent stable manure from serving as a breeding place for flies.

Disposal of human excreta.—Of all the rural homes in the county, only 16 were provided with water-closets, 781 had privies, and 1,689, or 67.94 per cent, had no toilets of any kind. Of the 16 water-closets, 7 emptied into insanitary cesspools, and from 9 the effluent went on the surface of the ground near the dwelling. Of the 781 privies in use, only 2 were of the sanitary "A" type, 7 were "B" type, 2 "C" type; 683 were of the grossly insanitary open-back ("E") type, the contents of which are exposed to flies, larger animals, and surface drainage; and 87 were surface privies boarded up at the back to exclude larger animals, but not flies, ("D") type. Thus, of the 2,486 homes at only 2, or 0.08 per cent, was provision made for sanitary disposal of human excreta.

Of the 781 privies in use 391 were used by all members of the household, 296 were used by some, usually the women and children, but not all the members of the household, and for 94 information on this point was not recorded.

At 665 of the homes where privies were in use the privy contents were accessible to chickens, cats, and dogs. At 462 of the homes the privy contents were likely to be carried, by domestic animals, on the feet of persons, or by surface washing and seepage, to the water supply; at 631, to the yard; at 557, to the truck patch or fruit grounds.

Of the homes at which privies were in use it was stated that the privy contents were removed at 4 once a day, at 225 once or twice a week, at 101 every two weeks, at 177 once a month; at 18 every two or three months, at 17 twice a year, at 13 once a year, at 36 never, and for 190 the frequency of cleaning was not recorded. At 605 of the homes privy contents were disposed of by being buried, at 19 they were washed away, at 50 scattered, at 5 used as fertilizer, at 11 disposed of by animals; for 91 the method of disposal was not recorded.

Water supply.—Water for drinking and culinary purposes was obtained from wells at 1,094 homes, from springs at 612 homes, from city supply at 1 home, and at 779 homes there was no source of water supply on the premises.

Of the 1,094 wells 1,013 were dug, 74 bored, and for 7 type was not recorded. One hundred and five were down slope from a privy and 238 down slope from a stable on the premises. The distance between well and privy was less than 50 feet on 19 premises, between 50 and 100 feet on 120, between 100 and 200 feet on 168, and over 200 feet on 126. The distance between well and stable was under 100 feet on 216 premises, from 100 to 200 feet on 323, and over 200 feet on 363. According to statements obtained 1 well was less than 10 feet deep, 144 wells were between 10 and 25 feet deep, 783 were from 25 to 50 feet, 80 from 50 to 100 feet, 6 over 100 feet, and for 80 of the wells the depth was not recorded. One hundred and thirty-four were protected to some extent against surface drainage by tight platforms and curbing. For 993 buckets, with rope or chain, were used to lift the water, 82 were provided with pumps, and for 19 the means of lifting the water was not recorded.

Of the 612 springs, 78 were down slope from a privy and 301 down slope from a stable on the premises. The distance between the spring and a privy or a stable, or both, was less than 50 feet for 6, between 50 and 100 feet for 28, between 100 and 200 feet for 105, and the distance was over 200 feet for the remainder. Four of the springs were covered and the water was delivered from them by piping. One hundred and fifty others were protected to some extent against surface drainage by ditching or curbing.

At 1,506 of the homes the water used by the family was considered by the head of the household safe, at 178 unsafe, and at 450 homes opinion of this point was not recorded. In contrast was the opinion of the investigator—the water supply being regarded by him from surface indications as unsafe at 1.654, or 95.65 per cent of the homes, safe at only 75, and at 405 investigator's opinion was not recorded.

Sanitary rating.—Scores were made of the water supplies, excreta disposal, screening, and general cleanliness at 2,337 of the country homes. On these points the score for 1,102 of these homes was under 5, and for only 71 over 50. The average sanitary rating given the country homes was 12.16 per cent.

Schools.—Seventy schools were surveyed. Of the number 7 were town schools and 63 rural. Of these schools 47 were for white pupils, 22 for colored, and for 1 this datum was not recorded. Thirty-seven were one-room schools, 14 were two-room schools, 9 were three-room schools, 3 were four-room schools, 4 had more than four rooms, and for 3 the number of rooms was not recorded. Ten of the schools were provided with insanitary privies. The other 60 had neither privy nor water-closet. In 30 schools the ventilation was good, in 12 fair, and for 9 poor. For 19 the state of ventilation was not recorded. Twelve schools got their water supply from wells, 19 from springs. For 48 schools the source of water supply was not recorded. At 4 there was evidence of expectoration on the floor.

Churches.—Sixty churches were surveyed, 42 being for white people and 18 for colored people. Forty-nine of these churches consisted of one room, 6 of two rooms, and for 5 the number of rooms was not stated. The ventilation at 40 of these churches was good, at 13 fair, at 2 poor, and for 5 data on ventilation were not recorded. Five of the churches were provided with insanitary privies, the other 55 having no toilets of any kind. The water supply at 3 of the churches was derived from wells, at 1 from a spring, and for 56 churches there was no source of water supply on the premises. At 8 churches evidence of expectoration on the floor was obtained.

Post offices.—Eight post offices were inspected, five of them consisting of one room, one of two rooms, and for two the number of rooms was not recorded. The ventilation in four of the post offices was good, in one fair, in two poor, and for one the ventilation was not recorded. These post offices were not provided with any toilets nor with any source of water supply on the premises. At four of the post offices the floor was grossly soiled with sputum.

Railroad stations.—Four railroad stations were inspected, each consisting of four rooms. The ventilation in two of them was good, in one fair, and for one not recorded. None of these stations was provided with either toilets or water supply.

Stores.—One hundred and eighty-five stores were inspected. Eighty-three of the stores consisted of one room, 60 of two rooms, 10 of three rooms, 5 of four rooms, 4 had more than four rooms, and for 23 the number of rooms was not recorded. The ventilation at 71 of these stores was good, at 50 fair, at 26 poor, and for 38 not recorded. Thirteen of the stores derived their water supply from wells, 1 from a spring, 25 from the city supply, and for 146 information as to source of water supply was not recorded. Thirty-eight stores were provided with sanitary privies, 23 (all in Chapel Hill) with water-closets, and 124 had no toilets of any kind. Only 81 were screened. At 73 sputum was observed on the floor.

Dairy farms.—Three dairy farms were surveyed. As to general cleanliness, one was classed as good, one as fair, and one as poor. As to cleanliness of methods in handling the milk, one was classed as good and two as poor. As to condition—screening, etc.—of dairy house, one was classed as good, one fair, and one poor. Two of the dairy farms were provided with sanitary privies, one with an insanitary privy. Two dairy farms derived their water supply from springs and one was not recorded on this point.

County health administration.—Other than the supervisory interest of the State board of health, there was no health organization or administration in Orange County. There was a county physician whose duties were attendance upon the inmates of the county jail and the county home. Chapel Hill alone had a part-time health officer. Because of the lack of public-health work in the county, it was practically a virgin field for rural sanitation work.

FINDINGS IN INCORPORATED TOWNS.

The three incorporated towns in the county, Hillsboro, Chapel Hill, and Carrboro, comprised an aggregate of 763 dwellings. Sixty-five of these homes were vacant and were inspected only, while 698 were canvassed and surveyed just as were the country homes. Of the 698 occupied homes, 380 were occupied by owners and 318 by tenants. Four hundred and twenty-one homes were occupied by white families, 237 by colored, and for 40 the race of the family was not recorded.

Seven hundred and forty-nine of the homes were frame, 3 were brick, 7 were log, and for 4 the construction was not recorded.

The number of rooms to the house was for 26 homes one, for 65 two, for 96 ree, for 170 four, for 116 five, for 82 six, for 46 seven, for 56 eight, for 31 ine, for 44 ten or over, and for the remainder not recorded.

General cleanliness was recorded for 413 of the homes as good, for 199 fair, r 75 poor, and for 11 the degree of general cleanliness was not recorded.

Two hundred and sixty-nine of the homes were well screened, 144 were orly screened, 282 had no screening, and for 3 the degree of screening was t recorded.

Five hundred and fifty-one of the homes obtained water supply from wells d 18 from springs on the immediate or near-by premises. One hundred and venty-nine (all in Chapel Hill) obtained water from a piped public supply. he wells were mostly of the dug type. The dug wells and the springs gen- ally were exposed to pollution from near-by privies.

One hundred and thirty-two of the homes were provided with water closets. f these water closets 119 (all in Chapel Hill) were connected with a public werage system, 5 discharged through private sewers into septic tanks, and 8 ischarged into insanitary cesspools. Five hundred and fifty-seven of the homes ere provided with privies, and at 74 of the homes there was neither water oset nor privy. Nineteen of the 557 of the homes with privies also had water- osets. Of the 557 privies, 3 were of "A" type, 7 of "B" type, 4 of "C" type, 13 of "D" type, 320 of "E" type, and of 10 the type was not recorded.

The sanitary rating of 119 of the town homes was under 5, and of 167 over . The average sanitary rating of all the town homes was 31 per cent. Thus e sanitary rating of the town homes was over twice as high as that of the untry homes, but on account of the greater density of population in the towns e protection of the towns against filth-borne infections was probably little, any, greater than that of the country neighborhoods.

Hillsboro.—Hillsboro, the county seat, is strictly a rural settlement. It is an d town, having been a settlement before the War of the Revolution. The opulation, estimated at the time of the survey, was 878. There were 223 omes inspected, of which 22 were vacant. The town had no public water ipply, no sewerage system, and no public lighting system. The incorporation cluded 1 square mile. Water was obtained from 94 wells. Disposal methods ere practically the same as those found in the country neighborhoods. There ere 198 privies, all insanitary—most of them being of "E" type—and 5 water- osets which discharged into cesspools. Histories of 130 cases of typhoid fever the town in the decade ending 1915 were elicited in the course of the canvass.

The citizens of Hillsboro took an active and intelligent interest in the survey om the outset and heartily supported the work in the town and in the county s a whole.

Chapel Hill.—Chapel Hill, situated in the southern part of the county, in e township of the same name, had an estimated population of 1,382. The niversity comprises 12 large buildings situated on a campus. The student ody during the school year numbers more than 1,000. During the early immer months some 700 teachers attend the summer course at the university. here were 347 homes inspected in the town, 30 of which were vacant. Among he residents of the town 83 cases of typhoid fever were recorded in the decade nding 1915. The university maintains a public water supply drawn from a mall stream north of the town. This supply, treated with coagulant and sub- ected to rapid filtration, was piped to all buildings of the university and to 29 homes in the town. The plant had been in operation a little more than year. It was constructed so that water pumped from the creek was received irectly into the coagulant chamber, sedimentation taking place for from two three hours, after which the water was passed over and through the filter beds, flowing by gravity into a clear water reservoir. From the reservoir the water was pumped to a stand pipe for distribution. The water from this plant was nearly turbidity free, but of questionable sanitary quality. The bacteriological examination of samples showed colon bacilli present at times. This question was taken up with the authorities of the university. As a result, treatment with hypochlorite of lime was applied, and the water from then on was found to be of good sanitary quality. The remaining homes of the town depended upon 77 wells and 7 springs for water. A sewer system, installed by the university, carried away the sewage from the university, and at the time of the survey from 119 of the town homes. Eight other homes had water-closets, 3 of which emptied into cesspools and 5 into septic tanks. At 19 homes both water-closets and privies were in use. Including the 19 at these homes, 191 privies all told were found in the town. Of these 191 privies only 3 were of sanitary type. The sewage was discharged into a small creek north of the town.

Carrboro.—Carrboro adjoins Chapel Hill on the west, and is a closely built up rural settlement. Cotton and knitting mills are the main source of employment, and about one-third of the homes are owned by the mill interests. A survey was made of the 193 homes, 13 of which were vacant. The population was estimated at 784, with a history of 47 cases of typhoid fever and 5 deaths from the disease in the decade ending 1915. In Federal Census of 1910 this town was unincorporated. Water was obtained from 55 wells and 3 springs. There were no sewers, and of the 168 privies in use not one was of sanitary type, most of them being of "E" or "D" type.

PREVALENCE OF TYPHOID FEVER.

The reporting of typhoid fever in the county was not required, prior to the survey, by either State or local laws, therefore there were no statistics of morbidity or mortality for previous years. In the course of the canvass among 10.826 persons enumerated in the country homes 889, or 8.2 per cent, gave a history of having had typhoid fever. Of these cases 62 occurred in 1914. The average number of cases annually in the decade ending 1915 was, according to the results of the canvass, 39. This number is almost certainly far below the actual. Histories of 8 deaths from typhoid fever in 1914, the year before the survey, were recorded. This number would give the county for that year a typhoid death rate of about 73 per 100,000 of population.

With the insanitary conditions which obtained the high typhoid fever prevalence was to be expected. Hookworm disease was also prevalent, and the death rate from intestinal infection of infants was, according to such evidence as could be obtained, high every summer.

SANITARY MEASURES RECOMMENDED.

For the country homes the usual measures—sanitary disposal of human excreta, protection of water supplies from pollution, screening of houses, and bedside prophylaxis—were recommended.

For the towns, installation of sanitary privy systems at once and the installation or the extension of sanitary sewerage systems and public water supplies as soon as practicable were recommended.

COOPERATION.

Hearty and active cooperation in the work was obtained from the State board of health, from the faculty of the University of North Carolina, from the local physicians, from the clergymen, from the county school authorities, from the local newspapers of each of the towns, and from the prominent individual citizens generally.

Several visits were made to the county by the secretary of the State board of health, who conferred with the officer in charge of the survey, made public addresses urging the people to support the program, and introduced the workers to local conditions. The State board of health further cooperated by furnishing one member of the survey force for the greater part of the survey period and several other of its representatives for a few days at a time, and by having made at the laboratory in Raleigh bacteriological examination of specimens of water and of other material sent from the county.

The faculty of the university gave strong moral support to the work and cooperated actively at every opportunity. They instructed their students engaged in making economic and social surveys in the county to advocate the sanitary measures recommended at all homes they visited.

The practicing physicians, although not required by law to do so, made prompt and apparently complete reports of cases of infectious disease occurring in their practice and made tremendous advance in getting carried out effective bedside prophylaxis.

The clergymen became earnest and zealous advocates of the sanitary program. August 15 was "Sanitation Sunday," and on that day in every church in the county in which services were held a sermon with sanitation as the theme was preached.

The county school board agreed to pay one half of the cost of installation of sanitary privies at schools located within school districts in which the district board would pay the other half of the cost, and also directed the county superintendent of schools to appoint and to instruct a health committee among the boys of each school to see after the privies of the school and to do all possible to improve the sanitary conditions around the school.

The local newspapers gave excellent publicity to the work and editorially strongly supported the health program.

The officials of each of the three towns passed and vigorously enforced ordinances requiring the sanitation of privies and the observance of other sanitary measures.

The ladies of the county formed the Orange County Sanitation League. The two main branches of this organization, with a membership of about 300, were in Hillsboro and Chapel Hill. The members of the league were enthusiastic and active and did much to develop popular sentiment and have the sanitary measures carried out.

The county commissioners, though apparently sympathetic and willing to give their moral support to the work, had by October 1 done nothing toward carrying out what had been accepted as practically an agreement on their part to appoint a whole-time county health officer. Therefore the following letter was presented to them:

UNITED STATES PUBLIC HEALTH SERVICE OFFICE,
Hillsboro, N. C., October 1, 1915.

To the BOARD OF COUNTY COMMISSIONERS,
Orange County, N. C.

GENTLEMEN: The sanitary survey of Orange County conducted by the United States Public Health Service in cooperation with the North Carolina State Board of Health will terminate on or about November 1. This work has been done with funds appropriated for the operations of National and State Governments and without cost to the county. The results in sanitary improvements and in disease reduction already attained more than justify the expenditures for the work. In order that these results may be progressively increased for the further protection of the health and prosperity of the citizens of Orange County, some definite work under the direction of the county authorities now is necessary, and in view of the evident popular sentiment obtaining, appears to me to be strongly indicated.

I therefore recommend to your consideration the appointment at once of a whole-time and properly qualified county health officer.

Respectfully,

(Signed) L. L. LUMSDEN,
Surgeon.

A short time after receiving this letter the commissioners, at a special meeting called to consider the matter, voted that on account of the state of finances of the county a whole-time county health officer would not be appointed at that time.

RESULTS.

Country homes.—Groups of representative homes in different neighborhoods were revisited to ascertain the degree of sanitary improvement accomplished subsequent to the first visit of survey. The aggregate number of homes in these groups was 1,156. At 41 (or 3.55 per cent) marked improvement in methods of excreta disposal, including the use of better types of privies, had been effected, while at 132 (or 11.42 per cent) of the homes, high-grade sanitary privies with water-tight receptacles and of fly-proof construction had been installed either in place of grossly insanitary open privies or at homes at which no privy had been in use. At 14 homes the families, according to their statements and according to all evidence which could be obtained, were consistently practicing the "Mosaic method" of excreta disposal. Besides the improvement in methods of excreta disposal, 131 homes (or 11.33 per cent) had made considerable progress in the protection of water supplies, in screening, and in general cleanliness of the premises.

Industrial settlements.—In the mill village, which subsequent to the survey has been included in the town of Carrboro, results were most gratifying. At every one of the 148 homes a sanitary privy was installed, giving the settlement a rating of practically 100 per cent on excreta disposal. At all of the homes owned by the operators of the two cotton mills at Hillsboro sanitary privies were installed.

Towns.—Seven hundred and sixty-three town homes were resurveyed. Of this number 636 were found on the first visit of the survey to have either grossly insanitary methods or no methods of excreta disposal, and therefore to be subject to radical improvement. At 547 (or 85 per cent) of these town homes either sanitary "A" type privies or water-closets were installed. At eight more of these town homes (1.25 per cent) there was some improvement in the privy and the method of excreta disposal. At 20 of the town homes (2.62 per cent) there was improvement in methods other than excreta disposal, such as safeguarding water supplies, more adequate screening, and a higher degree of cleanliness.

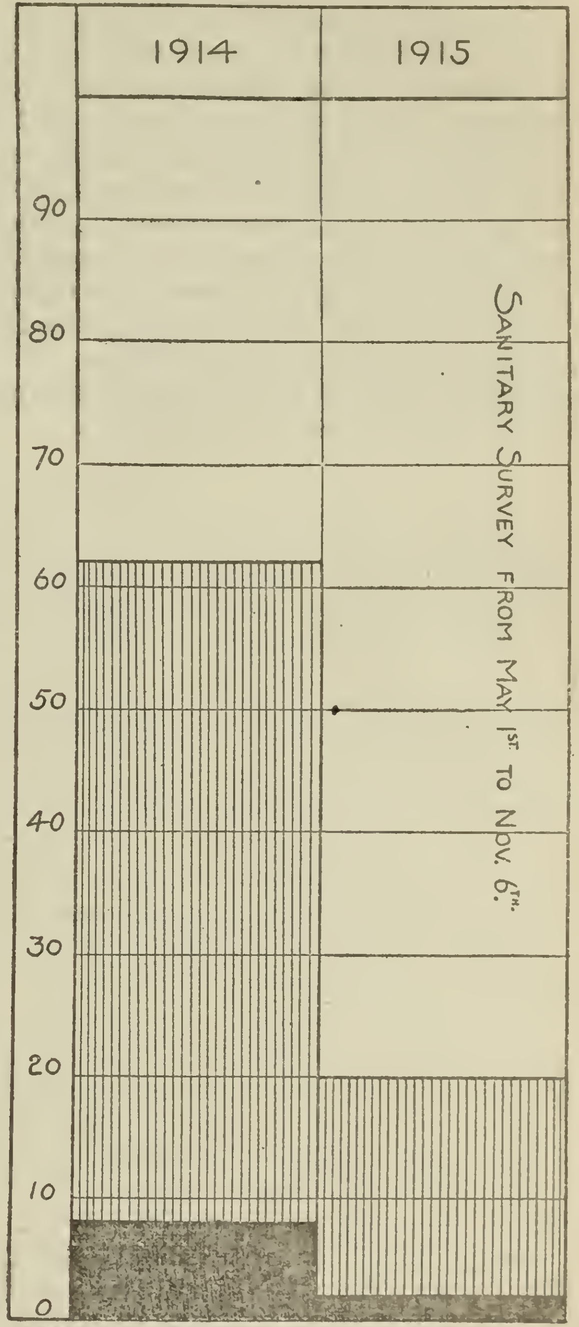
Hillsboro.—At the close of the survey only eight homes in Hillsboro had failed to complete the work of installing sanitary privies in compliance with the town ordinance.

Chapel Hill.—Upon completion of the survey of Chapel Hill a report was made to the town authorities, and on August 23 a sanitary ordinance was passed. Sewer connections were made and privies remodeled or built new. At the close of the survey but six homes in the town had not completed the installation of sanitary devices in compliance with the sanitary ordinance, and the work was still in progress.

Carrboro.—The results of the survey of this town were reported to the authorities, and a sanitary ordinance was passed September 20. The time limit of this ordinance was subsequently extended by council to December 1, 1915.

At the close of the survey only 100 privies had been sanitated, but the work was still in progress and was completed within the three months following. The mill owners showed great interest in the survey, and an excellent type of sanitary privy was provided for all mill-owned homes.

CHART 11 -TYPHOID FEVER REDUCTION FOLLOWING SANITARY SURVEY IN ORANGE COUNTY, N.C.



Typhoid fever reduction.—In 1914, the year before the survey, there were in the county, according to the findings from the canvass, at least 62 cases of and 8 deaths from typhoid fever. In 1915, the year of the survey, there were, according to what appeared accurate and complete reports, only 20 cases with 2 deaths from typhoid fever in the county (chart 11).

The following table gives the occurrence of cases, by months, so nearly as could be ascertained, for the two years:

	1914	1915
January		1
February	1	2
March		
April	1	
May	5	1
June	15	3
July	19	10
August	7	3
September	6	
October	6	
November	1	
December	1	
Total	62	20

The markedly decreased rate for the summer and fall of 1915 appeared to result from the sanitary improvements and from the improvement in bedside precautions.

General results.—The following is an example of the results from this kind of work which can not be accurately estimated:

The writer, in December, 1917, while traveling through one of the Middle West States, overheard a conversation among some gentlemen in the smoking compartment of a Pullman. One of them, in discussing the training of our soldiers in the national camps, said: "When the men return to their homes they will not tolerate conditions like those privies (pointing to a row of insanitary privies) in this town we are passing through at present; because they will then know, as I do now, that from such conditions typhoid fever, hookworm disease, dysentery, and other diseases are spread." Later on it was ascertained that the gentleman who made this statement is a prominent chautauqua lecturer. Upon being asked how he got the sanitary idea he replied that he got it while taking part in a chautauqua at Hillsboro, N. C., in 1915, and that he had been talking it at every opportunity ever since that time.

RESURVEY IN 1916.

In the fall of 1916 the writer spent two days in the county to ascertain what progress in sanitation was being made. The work of installing sanitary privies in Carrboro and in Chapel Hill had progressed practically to completion. In Hillsboro most of the privies were found to be still in good condition, but some, on account of rusting out of screening or of poor carpentering originally were not fly proof. The scavenger work in Carrboro and Chapel Hill appeared to be good and in Hillsboro only fair. The attention of the mayor of Hillsboro was called to the retrogression in his town and he stated that he would take prompt steps to have the conditions corrected.

So far as could be ascertained, considerable progress in sanitation was being made in the country neighborhoods. The practicing physicians stated that the morbidity rate from intestinal infections in the county had been remarkably low in 1916, as was the case in 1915.

SANITARY SURVEY OF WALKER COUNTY, ALA.

In response to requests from the State board of health and the county board of health, Walker County, Ala., was included in the group of counties to which the sanitary survey was extended in 1915. The special reasons for the selection of this county were (1) it appeared to present economic and social conditions fairly representative of the extensive agricultural and mining sections of Alabama, (2) its annual rate of prevalence of typhoid fever was high, (3) the corporation ownership of the numerous mining camps in the county seemed to offer opportunity for sanitary improvements in mass, and (4) this county was the first in Alabama to have a whole-time county health officer.

Active cooperation in the survey was promised by the State board of health and by the county board of health.

The survey of Walker County was begun May 10, 1915, and terminated November 1, 1915.

GENERAL CONDITIONS.

Walker County is located on the west bank of the Black Warrior River, in the foothills of the Blue Ridge Mountains in the northwestern part of the State of Alabama. It lies between meridians of longitude 87–88 and parallels of latitude 33–34. The land area is 777 square miles, a large proportion of which is wooded.

The county for the most part is hilly or rolling, with level swampy stretches along the numerous streams. The surface stratum of soil for most parts of the county is clay, with varying proportions of sand. Beneath the clay stratum lie strata of sand, flint, and limestone, which outcrop here and there in different sections of the county. Extensive deposits of coal are found.

According to the census reports, the population of the county in 1910 was 37,013, 82.3 per cent being white and 17.7 per cent negro. The males numbered 19,416 and the females 17,597. Of the white inhabitants, 1.7 per cent were of foreign or mixed parentage, and only 1.3 per cent were foreign born. Of persons 10 years old and over, 16.2 per cent were recorded as illiterate. The population per square mile was 47.6 and in the rural section 44.4. The population has progressively increased in the decades since 1880. In that year it was 9,479; in 1890 it was 16,078; in 1900 it was 25,162.

The principal industries are farming, coal mining, and stock raising. There are in the county one large cotton mill and one large sawmilling establishment.

Some of the farm land is in a high state of cultivation, but most of the farms are small and poor. According to the census reports for 1910, the number of farms in the county was 2,655. Of these 1,892 were operated by owners, 757 by tenants, and 6 by managers. Of the 497,280 acres of land in the county, 250,003 acres were in farms. Of the farm acreage only 76,147 acres were improved, 151,627 acres being in woodland. The average acreage per farm was 94.2, of which 28.7 were improved. The value of farm land per acre was given as $7.97. The value of all farm property in the county was given as $3,661,179. The value of the crops in 1910 was estimated at $1,281,334.

The principal crops are cotton, corn, hay, and tobacco. The cotton-raising industry has suffered seriously in recent years from invasion with the boll weevil. On this account a good many small farms have been abandoned and their workers have found employment in the coal mines and the mills. The drift of the population from the more or less isolated farm homes to the crowded industrial settlements has been an important factor in the sanitary situation.

Stock raising had become recognized as an industry of promising potentialities for the county, and in 1915 an active campaign for the eradication of cattle ticks was being carried on.

There were in 1915 about 30 coal mines in operation in the county. Most of the workers in the coal mines and also in the mills are of native white stock.

At the mines and mills the houses occupied by the operatives and their families are as a rule owned by the corporations or individuals financing the industry. The larger of these industrial settlements are laid off as towns, and, though some few had made considerable progress in sanitation, most of them when the survey was begun in 1915 presented the crowded conditions of town life and the insanitary conditions commonly found in strictly rural, sparsely settled communities.

The county is well provided with railway facilities and, since the completion of the locks and dams on the Black Warrior River in 1915 a waterway to the Gulf of Mexico has been provided for traffic. Only a small proportion of the public wagon roads of the county are improved.

There are in the county seven incorporated towns, as follows: Jasper, with a population (in 1910) of 2,509, and Carbon Hill, Cordova, Dora, Townley, Oakman, and Nauvoo, with populations, respectively, in 1915, of about 1,800, 1,600, 1,200, 850, and 275. Jasper is the county seat.

The climate is temperate for the latitude and naturally healthful. In the low-lying sections along the river banks there are numerous collections of stagnant water, furnishing breeding places for Anopheline mosquitoes, and in these sections malaria is quite prevalent in the late summer and early fall seasons. Except for these sections, constituting less than one-fourth of the county's area, the county presents many natural advantages for healthful living. In spite of these natural advantages, however, and due to the readily apparent and correctible insanitary conditions, the rate of prevalence of typhoid fever and hookworm disease and the infant-mortality rate for the county, as a whole, had been high for all the years of which there was any record prior to that of the sanitary survey, 1915.

The distribution of hookworn disease in the county was exceedingly interesting. The prevalence of the disease was high in the northern half, the farming section, and low in the southern half, the mining section. The striking difference could not be accounted for by the difference in sanitary conditions. The most probable reason is difference in soil formation, with perhaps the waste from the mines in the soil tending to prevent the development of the hookworm.

PLAN AND SCOPE OF SANITARY SURVEY.

The work comprised (1) a canvass and a sanitary survey of all homes in the county, including those in the rural neighborhoods, the industrial settlements, and the incorporated towns; (2) a sanitary survey of the seven incorporated towns; (3) a sanitary survey of churches, railway stations, post offices, and stores in the rural districts; (4) public addresses on the subject of sanitation, with lantern-slide illustrations in all sections of the county; (5) distribution of literature on different phases of the subject of sanitation; and (6) the epidemiological investigation of cases of typhoid fever as they developed.

The force engaged in the detailed work consisted of the county health officer, the assistant State health officer, who was assigned by the State board of health to duty in Walker County for the whole period of the survey, and the ficers of the Public Health Service. The maximum number of officers of the ublic Health Service on duty in the county at any one time was nine, and the inimum was three, with an average of five for the whole period of the survey. Headquarters were established in the office of the county health officer in the urthouse at Jasper. Circular letters, signed by the Surgeon General of the ublic Health Service and by the State health officer, explaining the plan and rpose of the work, were mailed from the office of the State board of health Montgomery to all persons whose names appeared on the registration list of e county.

Thorough publicity was given to the work at its beginning through the local wspapers and through a series of public meetings held in different parts of e county. These preliminary public meetings were addressed by the county alth officer, by prominent local citizens, and by the officer in general charge field operations of the Public Health Service in rural sanitation. The last entioned officer and the county health officer, in the first two weeks of the rvey period, made preliminary surveys of the incorporated towns and most the industrial settlements in the county, and explained to the officials of ese communities the line of sanitary work contemplated. In these visits the portance of sanitation from a strictly business standpoint in the industrial mmunities was emphasized.

For convenience in making the survey, the county was divided into districts, e boundaries for the districts being railroads, streams, or county roads, which ere arbitrarily selected and which formed readily recognizable boundaries. r transportation in visiting rural homes, the men used automobiles.

Endeavor was made in the visits to the homes to ascertain by careful quesning the history of each family in respect to the incidence of disease in genal and of typhoid fever in particular. The survey of the premises was usually ade in company with a member of the household, the head of the house wherer practicable. Attention was directed especially to human excreta disposal, ble manure disposal, water supplies, and screening.

In the different districts into which the county was divided for the work the nvass and survey of the homes in the towns and the industrial settlements ually preceded that of the strictly rural homes. This sequence was adopted th a view to having the sanitary improvements in these centers of populan serve as a demonstration for those living in the sparsely settled country ighborhoods.

In each neighborhood, as a rule, a public lecture was given at the beginning of e survey and another some time after the round of visits to the homes had en completed. The first lecture dealt with the general principles of sanitation d prepared the people for what to expect and how to obtain useful informan when the investigator reached their homes. The second lecture dealt specifilly with the sanitary measures needed and the methods for carrying them out that particular community.

The number of public lectures given in the course of the work was 71. The tendance at the lectures averaged remarkably large, the total number of perns attending them being about 14,000.

Literature on sanitary subjects was sent out from headquarters by mail upon quest.

For certain hours on Saturdays, when many farmers came to Jasper, the ficer in immediate charge of the survey or the county health officer remained headquarters to discuss sanitation with the many visitors who came to the ice.

The survey covered 4,887 rural dwellings—including 2,592 homes in the untry neighborhoods and 2,295 homes in the industrial settlements—and 2,105 vellings in incorporated towns, a total of 6,992.

After the first round of visits to the homes had been completed, revisits were made to practically all the homes in the towns and in the industrial settlements and to 1,004 country homes, with a view of determining the degree of sanitary improvement in the county as a whole resulting from the educational phase of the survey.

FINDINGS IN RURAL SECTIONS.

In the report of findings for the county, "rural sections" comprise the homes in the country neighborhoods and in the industrial settlements, and, though each of the towns except Jasper had a population of less than 2,500, "towns" comprise the homes located in the incorporated towns.

Of the 4,887 dwellings in the rural sections, 77 were vacant, and only partial data for them were obtained.

Popular attitude toward the work.—At only 9, or 0.18 per cent, of the 4,810 occupied homes did the investigators fail to meet with a cordial reception. The citizens generally seemed anxious to obtain suggestions about needed corrections of insanitary conditions at their homes.

Race.—Three thousand seven hundred and ninety-three dwellings were occupied by white families and 1,017 by negro families.

Nationality.—At all of the homes except 52 the head of the household was American born. Of those of foreign birth, 11 were English, 3 Scotch, 14 French, 8 Italian, 8 German, 3 Danish, 1 Greek, 1 Austrian, 1 Mexican, 1 Belgian, and 1 Judean.

Duration of residence in county.—At 3,909 homes the duration of residence of the head of the household in the county was stated as follows: Under 1 year, 281; 1 to 5 years, 606; 5 to 10 years, 457; 10 to 20 years, 586; and over 20 years, 1,979.

Occupation.—At 1,906 homes the head of the household was a farmer, at 1,982 the head of the household was a miner. The occupations of the remaining number of heads of household were various.

Sale of foods.—From 212 of the homes foods, such as are usually eaten uncooked, including milk and vegetables, were sold more or less regularly. Most of these foods were sold in near-by markets, but some went into markets outside Alabama.

Number in household.—The number of persons in 4,810 homes was 23,729, an average for each home of 4.9.

Number of rooms to house:	Dwellings.
With 1 room	66
With 2 rooms	1,084
With 3 rooms	1,394
With 4 rooms	1,617
With 5 rooms	404
With 6 rooms	198
With 7 rooms	64
With 8 rooms	30
With 9 rooms	15
With 10 rooms	5
With 11 rooms	4
With 12 rooms	1
Over 12 rooms	5
Total	4,887

Construction of dwelling.—Four thousand seven hundred and forty-nine of the houses were of wooden-frame construction, 8 were of brick construction, and 130 were built of logs.

General cleanliness.—The general cleanliness of premises was recorded as good for 1,008 homes, fair for 2,373 homes, and poor for 1,483 homes. For 23 this datum was not recorded.

Cellar or basement.—Three hundred houses had cellars or basements and 4,587 had none.

Screening in summer.—At 3,623 (or 75 per cent) of the homes there was no screening, and flies had abundant opportunity to go from near-by collections of filth to foods exposed in dining rooms and kitchens. At 823 of the homes the screening of dining room and kitchen was complete; at 364 the screening was incomplete, serving to exclude probably 50 per cent of the flies seeking admission; and at 77 of the homes the presence or absence of screening was not recorded. Most of the well-screened dwellings were among those in the industrial settlements. Among the country homes a screened dwelling was notably exceptional.

Topography.—Two thousand eight hundred and ninety-four of the houses were located on rolling ground, 1,055 on hilly ground, and 938 were on level ground.

Animals on premises.—At 548 of the homes cows, horses, poultry, hogs, dogs, and cats were kept; and at 673 none of these animals were kept. At 2,058 homes cows were kept, at 1,631 there were horses, at 3,176 poultry was kept, at 2,454 there were hogs, at 1,569 dogs, and at 2,022 there were cats.

Stable manure.—Of all the rural homes in the county at which animals were stabled, at only 86 was any provision made to prevent stable manure from serving as a breeding place for flies. The provision in some instances consisted of nearly fly-tight bins, but in most instances of frequent (weekly) removal and scattering of the manure.

Disposal of human excreta.—Of the 4,887 rural homes, 8 were provided with water-closets, 2,580 were provided with privies, and at 2,299 (or 47.05 per cent) no toilet of any kind was provided.

Of the 8 water-closets, the effluents from 3 went into septic tanks, those from 4 into insanitary cesspools, and the effluent from 1 went into an open (dry) ditch near the dwelling.

Of the 2,580 privies, 394 were sanitary (type A); 133 were provided with water-tight receptacles, but not constructed so as to exclude flies from the excreta (type B); 80 were screened from flies, but not provided with water-tight receptacles (type C) and thus permitting soil pollution and the endangerment of near-by water supplies; 90 were boarded up at the back and sides so as to exclude larger animals but not flies (type D); and 1,883 were of the open-in-back, grossly insanitary type (E), allowing the excreta to be scattered about by various agents.

All of the sanitary (type A) privies, except three or four, and most of the B type privies were found at homes in the industrial settlements. At the vast majority of the strictly country homes the methods of disposal of human excreta were very primitive. Over 80 per cent of these homes were found to be without toilets of any kind, and the men, women, and children constituting this large number of households resorted to the woods, stables, or fields nearby the premises to void their excretions and leave them exposed on the surface of the ground.

At 97 dwellings the privy was less than 50 feet from the water supply. At 406 homes the distance was between 50 and 100 feet, and in 578 homes the water supply was more than 100 feet distant from the privy. For 1,499 privies the distance from the water supply was not recorded.

Of the 2,580 homes at which there were privies, 2,365 were used by all members of the family, 106 were used by a part of the family, and for 109 this datum was not recorded. The large proportion of homes at which all the members of the family used the privy is accounted for by the fact that the majority of the homes at which there were privies were in the industrial settlements.

At 761 of the rural homes, chiefly in the industrial communities, the disposal of privy contents was effected by scavenger, these scavengers cleaning the privy once a week and burying the filth at a safe distance from the water supplies. At 526 homes the disposal of privy contents was attended to more or less regularly by a member of the household or an attendant on the farm. Disposal at these homes was also by burial. At 7 dwellings the excreta was burned. At 806 homes the excreta was raked away from the privies and scattered, and in a few instances used as fertilizer for crops. At 115 homes cleaning of the privy was left to natural drainage and the attentions of barnyard animals, in some instances chickens being encouraged in eating and scattering of the filth. At 365 homes the disposl of privy contents was not recorded.

At 764 homes the privy was cleaned once a week, at 344 every two weeks, at 675 once a month, at 116 every two months, at 17 every six months, at 39 once a year, and for 145 homes this datum was not recorded.

Water supply.—The source of the water supply was tabulated for 3,131 rural homes. Of these, water for drinking and culinary purposes was obtained from wells in 2,471 instances, from springs in 530 instances, and from cisterns in 2 instances; 123 families used town water supplies, and 5 families drank river water. Of all of these water supplies only 866 were considered safe, the remainder, 2,265, being, from surface indications, flagrantly unsafe or doubtful. In striking contrast to the opinion of the investigator was that of the head of the household, who in 2,925 instances maintained that the water was pure, and in many instances claimed that it was the best water in the county.

Of the 2,471 wells, 142 were downhill from the privy, and 203 were downhill from the stable. Ninety-seven wells were less than 50 feet from the privy, 406 were less than 100 and more than 50 feet distant, and 578 were over 100 feet distant; for 1,390 the distance was not recorded. In most instances in which the distance between well and privy was not recorded there was no privy on the premises.

One hundred and fifty-one wells were within 50 feet of the stable or barn, 503 were between 50 and 100 feet distant, and 836 were over 100 feet away from the stable or barn; for 981 the distance was not recorded. The distance between the water supply and the stable was a factor of importance because of the frequent use of the stable as a place for deposit of human excreta.

One thousand one hundred and forty-four of the wells were dug, 1,327 bored. Most of the bored wells were provided with water-tight casing. Practically none of the dug wells were so provided.

Eight wells were less than 10 feet deep; 412 between 10 and 25; 1,281 between 25 and 50; 653 between 50 and 100; 39 over 100, and 78 not recorded. Two thousand three hundred and thirty-four wells had buckets, 97 were provided with pumps, and for 40 the means for lifting the water was not recorded.

Six hundred and twenty-two of the wells had tight platforms, and 1,554 were curbed so as to prevent to some degree the entrance of surface drainage.

Two underground cisterns were found, one of which was considered watertight, and one allowed of subsurface seepage.

Of the 530 springs, 52 were down slope from the privy, and 122 were down slope from the stable. The distance between spring and privy was less than 50 feet for 12, between 50 and 100 feet for 27, over 100 feet for 98, and not recorded for 393. In most instances in which the distances was not recorded there was no privy on the immediate or near-by premises. At 3 homes the spring was within 50 feet of the stable, at 19 between 50 and 100 feet, and at the remainder the distance between spring and stable was over 100 feet. Twenty-five of the springs had piping to deliver the water so as to exclude contamination by hands, dippers and buckets, 125 had ditches around them to protect them to some degree from surface drainage, and the remainder were exposed to both surface and subsurface drainage.

Industrial settlements.—At the time of the survey there were in Walker County 30 coal-mining camps, one cotton-mill village, and one sawmill camp. The findings in these industrial settlements, except for the cotton-mill village and five mining camps located within incorporated towns, are recorded with those for the rural sections.

The standard of sanitation in the rural mining camps, as a rule, was considerably higher than that of the farm homes. But the greater density of population in the camps in many instances more than offset the somewhat better degree of sanitation.

The cotton-mill village at Cordova and several of the mining camps in the county, presented on the first round of the survey high-grade sanitary conditions. At these settlements the sanitary improvements had been made within the previous year on the recommendations of the county health officer.

It was exceedingly interesting to note with what remarkable accuracy the rates of prevalence of typhoid fever, of summer diarrhea (enterocolitis) of infants, and of pellagra, in different camps could be estimated after a quick observation had been made of the types of privies and of water supplies in use and of the degree of screening of the dwellings, and after an inquiry had been made at the camp commissary about the per capita amount of red meats and beans sold weekly.

Schools.—A systematic and thorough inspection of the 125 schools in Walker County was being made by the county health officer. On these inspections, sanitation of the school was discussed, physical examinations of the pupils made and lectures on cleanliness, adapted to the different grades, were given. For this reason the inspection of the schools during the survey was left in the hands of the county health officer. A report of his findings is to be found in the annual report of the Walker County board of health for 1915.

Churches.—Forty-one churches in the rural sections were surveyed. Only five had sources of water supply on the church premises. The remainder obtained water from near-by farms. Most all the water supplies used at the churches were from obviously unsafe or questionable sources, and in the churches the old-fashioned bucket and public dipper were commonly in use. Only six of the churches were provided with toilets. Of these, one had a B type privy, one a C type privy, and four open-in-back, E type, privies.

Railroad stations.—Ten railroad stations in the rural sections were surveyed. The ventilation was recorded as good for seven and fair for three. General cleanliness was good at six and fair at four. Two of the stations were not provided with toilets of any kind; four had open-back insanitary type (E) privies; one had a type D privy (for whites only); one had a type C privy (for whites only); one had water-closets connected with a sewerage system, and one had sanitary, type A, privies.

Post offices.—Twelve post offices in the rural sections were surveyed. The general cleanliness was recorded as good for six, fair for five, and poor for one. At one the floor was badly soiled from promiscuous spitting. At 10 there was no toilet of any kind. Two were provided with privies—one with a sanitary (A type) privy and the other with an insanitary (E type) privy.

County health administration.—Under the laws of Alabama the county medical society of the county is the county board of health. The executive committee of the board in Walker County consists of three physicians elected by the society and the executive of the committee is a whole-time county health officer, paid a salary of $2,500 a year. The position of whole-time health officer was established in 1913. The county was fortunate in securing the services of a well-qualified, conscientious, very active, and highly efficient officer for this position. The health work in the incorporated towns, as in the other parts of the county, comes under his jurisdiction. Considering the wide extent of his field of operations, it seemed at the time of the survey that he had made good progress and was popularizing his work. It appeared that he had succeeded in what the writer regards as essential to success in local health administration, viz. making health work good politics. Candidates for political preferment in Walker County generally included in their platforms a conspicuous plank indorsing the work of the whole-time county health officer.

The duties of the health officer consist of (*a*) the collection and recording of vital statistics and morbidity reports, (*b*) the enforcement of quarantine and general sanitary measures, (*c*) sanitary surveys of communities, (*d*) attendance of sick at county jail and poor farm, (*e*) laboratory examinations of specimens from suspected cases of tuberculosis, hookworm disease, and other diseases, and (*f*) general educational work along health lines through private discourse, public meetings, newspaper articles, and other media.

In his fight against tuberculosis he is assisted by a whole-time health nurse furnished by the Walker County Antituberculosis Association. In the recording of statistics he is assisted by a part-time clerk furnished by the county, and in one of the towns (Jasper) he is assisted by a part-time sanitary policeman.

Thus it was found that Walker County had made good progress in the development of county health work.

Sanitary rating.—At all of the rural homes visited (4,887) a score was estimated and recorded. This score, having a maximum of 100, was based on 50 for perfect disposal of excreta, 30 for perfect water supply, 10 for complete screening of dining room and kitchen, and 10 for general cleanliness. The average sanitary rating recorded for these 4,887 homes was 28.22 per cent.

FINDINGS IN INCORPORATED TOWNS.[1]

The findings at the 2,105 homes in the 7 incorporated towns are presented below in tabular form:

Incorporated towns.

	Jasper.	Carbon Hill.	Cordova.	Dora.	Townley.	Oakman.	Nauvoo.	Total.
Number of houses inspected	583	402	364	278	230	187	61	2,105
Number homes canvassed and surveyed	547	402	364	251	211	179	60	2,014
Number of persons in homes canvassed	2,352	1,739	1,866	1,080	990	804	298	9,129
Average	4.3	4.3	5.1	4.3	4.2	4.4	4.9	4.5
Number persons giving history of having had typhoid fever	223	221	185	55	44	87	18	836
Number of homes occupied by owner	230	177	87	96	26	76	32	724
Number of homes occupied by tenant	312	225	277	155	185	103	28	1,290
Race:								
Number of white families	425	226	325	198	141	129	57	1,501
Number of colored families	122	176	39	53	70	50	3	513

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[1] Figs. 41, 42.

Incorporated towns—Continued.

	Jasper.	Carbon Hill.	Cor-dova.	Dora.	Town-ley.	Oak-man.	Nau-voo.	Total.
uration of residence of head of household in county:								
Less than 1 year	34	23	33	15	19	8	6	138
1 to 5 years	77	71	62	28	38	13	13	302
5 to 10 years	83	57	56	56	25	20	6	303
10 to 20 years	93	98	106	62	35	41	16	451
20 years or more	260	153	107	90	91	97	19	820
uration of residence of family in present home:								
Less than 1 year	175	150	170	36	92	74	23	720
1 to 5 years	165	114	112	39	88	41	15	574
5 to 10 years	86	68	42	69	20	35	9	329
10 to 20 years	77	54	38	57	6	26	11	269
20 years up	44	16	2	50	5	3	2	122
arm produce sold:								
Milk, fruit, and vegetables	19	2	33	....	....	....	....	54
Milk	18	1	28	....	....	....	....	47
Fruit	2	....	1	....	....	....	....	3
Vegetables	2	1	8	....	....	....	....	11
umber in family:								
1	12	7	1	4	5	3	....	32
2	81	72	38	51	23	24	7	296
3	102	88	51	60	45	40	9	395
4	115	78	73	40	34	32	13	385
5	85	55	56	33	30	36	10	305
6	65	33	53	27	31	12	10	231
7	39	37	42	13	24	16	2	173
8	25	15	23	8	12	8	5	96
9	12	8	12	4	3	4	1	44
10	5	3	9	8	3	3	1	32
11	2	4	4	1	1	1	2	15
12	3	2	1	1	....	....	....	7
13	1	....	....	1	....	....	....	2
14	....	....	1	....	....	....	....	1
tock on premises:								
All	6	6	1	8	4	8	4	37
None	130	95	97	77	79	28	9	515
Cows	145	99	94	59	36	48	27	508
Horses	106	43	29	41	20	31	20	290
Poultry	379	215	227	162	96	121	33	1,233
Hogs	152	94	88	59	72	66	30	567
Dogs	82	103	55	59	51	32	5	381
Cats	189	114	75	74	51	57	25	585
eneral appearance of homes:								
Good	257	232	226	24	97	15	25	876
Fair	201	127	77	182	109	65	34	795
Poor	125	43	61	72	24	107	2	434
onstruction of dwelling:								
Frame	583	402	364	276	229	187	61	2,102
Brick	....	....	....	....	....	....	....	....
Log	....	....	....	2	1	....	....	3
umber of rooms to house:								
1	7	7	1	2	1	....	....	16
2	23	45	27	27	12	18	7	159
3	72	79	53	50	44	22	19	339
4	126	125	183	107	110	55	15	721
5	117	86	45	46	23	42	6	365
6	97	29	22	13	10	26	7	204
7	32	17	15	3	8	10	5	90
8	23	7	7	2	2	5	....	46
9	17	2	6	....	....	....	....	25
10	18	2	1	....	1	....	....	22
11	8	....	1	....	....	....	1	10
12	4	2	1	1	....	....	....	8
Over 12	3	3	2	....	....	1	....	9
eneral cleanliness:								
Good	269	208	167	29	88	17	27	805
Fair	206	144	140	196	124	84	29	923
Poor	108	50	57	53	18	86	5	377
ellar:								
Homes having cellars	32	29	14	3	....	5	5	88
Homes having no cellars	551	373	350	275	230	182	56	2,017
creening:								
Complete	300	193	152	57	78	77	32	889
Partial	79	35	40	89	11	25	1	280
None	204	174	172	132	141	85	28	936
ource of water supply:								
Public piped supply	239	171	168	....	29	....	....	607
Wells	197	158	135	140	52	96	46	824
Cisterns	2	....	....	....	....	....	....	2
Springs	1	1	32	11	....	1	....	46

Incorporated towns—Continued.

	Jasper.	Carbon Hill.	Cordova.	Dora.	Townley.	Oakman.	Nauvoo.	Total.
Source of water supply—Continued.								
None on premises	127	102	26	127	139	90	15	626
Public supply obtained	(1)	(2)	(3)	....	(1)	....	....	....
Sanitary quality of public supply	(4)	(5)	(6)	....	(4)	....	....	....
Character of private wells:								
Dug	78	52	71	54	16	55	21	347
Bored	119	106	64	86	36	41	25	477
Equipment of wells:								
With good casing	125	112	85	81	45	65	28	541
With good curbing	149	111	95	135	51	69	32	642
With buckets	188	155	134	133	52	75	44	781
With pumps	9	3	1	7	....	21	2	43
Depth of wells:								
0 to 50 feet	119	132	106	91	39	85	38	610
51 to 100 feet	74	20	26	45	10	11	7	193
100 feet and up	4	6	3	4	3	....	1	21
Drainage toward well:								
From privy	13	20	6	29	4	20	5	97
From stable	12	16	1	21	3	9	2	64
Distance of well from privy:								
0 to 50 feet	40	36	67	55	9	50	2	259
50 to 100 feet	135	77	53	74	24	36	26	425
100 feet or over	22	45	15	11	19	10	18	140
Springs protected from surface drainage:								
By curbing	....	....	7	1	....	....	....	8
By walling	1	....	9	....	....	1	....	11
By ditching	1	....	16	....	....	....	....	17
Water obtained from springs:								
By piping	....	....	12	3	....	1	....	16
By dipping	1	1	20	8	....	....	....	30
Drainage toward spring:								
From privy	1	1	1	7	....	1	....	11
From stable	....	....	....	7	....	1	....	8
Distance of spring from privy:								
0 to 50 feet	....	....	3	6	....	....	....	9
51 to 100 feet	....	1	6	4	....	....	....	11
100 feet or over	1	....	23	1	....	1	....	26
Cisterns:								
Water-tight	2	....	....	....	....	....	....	2
Not water-tight	....	....	....	....	....	....	....	....
Excreta disposal—Number of homes with:								
Privies	319	390	354	235	211	169	54	1,732
Water-closets	[7] 233	1	1	2	....	....	....	237
Without toilets of any kind	31	11	9	41	19	18	7	136
Effluent from water-closet discharged:								
Into city sewer	163	....	....	....	....	....	....	163
Into septic tank	....	....	1	....	....	....	....	1
Into cesspool	....	1	....	2	....	....	....	3
Class of privies:								
A	38	5	132	2	100	5	14	296
B	16	3	1	2	7	4	3	36
C	73	291	45	....	....	5	....	414
D	38	21	6	4	1	6	9	85
E	154	70	170	227	103	149	28	901
Distance of privy from kitchen door:								
0 to 50 feet	90	107	200	122	64	96	5	686
50 to 100 feet	199	273	96	96	118	48	34	864
100 feet up	30	8	58	17	29	25	15	182
Privy cleaned:								
Once a week	139	374	215	35	....	6	1	770
Every two weeks	167	10	75	25	140	23	16	456
Once a month	9	4	35	50	60	35	12	205
Every six months	....	....	12	5	4	80	9	110
Once a year	....	....	5	4	....	4	1	14
Never	4	2	12	116	7	21	15	177
Attitude of persons interviewed toward suggestions for sanitary improvements:								
Agrees to carry out	112	330	15	163	20	65	27	741
Interested	320	31	331	68	178	82	27	1,037
Indifferent	4	1	12	3	....	2	1	23
Opposed	1	....	1	....	....	....	....	2
Not recorded	....	....	....	....	....	....	....	211
Average sanitary rating of premises	59.90	51.25	59.54	18.53	45.52	40.71	39.11	44.95

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[1] From drilled wells.
[2] From bored wells.
[3] From cave stream.
[4] Fairly good.
[5] Good.
[6] Questionable.
[7] At 19 of these homes there were also privies for use of servants.

TYPHOID FEVER PREVALENCE.

According to the reports made to the county health officer, there were in
e county in 1914, the first year for which the records approached complete-
ss, 130 cases of typhoid fever, with 18 deaths. The 18 deaths gave the county
r that year a typhoid fever death rate of approximately 45 per 100,000 of
pulation.

The occurrence of cases and deaths, by months, in 1914, according to the
ports, were as follows:

	Cases.	Deaths.		Cases.	Deaths.
nuary	9	....	August	14	3
bruary	12	2	September	12	2
rch	6	1	October	12	3
ril	4	....	November	8	1
y	2	....	December	13	....
ne	5	2			
ly	33	4	Total	130	18

Thus, the period of specially high prevalence was from July 1 to November 1.

Of the 32,815 persons enumerated in the course of the house-to-house canvass
the county, 2,560, or 7.4 per cent, gave a history of having had typhoid fever.
these cases 1,724 had occurred among residents of the rural sections and
6 among residents of the towns. The canvass obtained histories of 167 cases
veloping in the county in 1914, of which 107 were in the rural sections and
in the towns. Since there are more than twice as many inhabitants in the
ral sections as in the towns, the rate of prevalence of typhoid fever appears to
ve been considerably higher in the towns than in the country neighborhoods.
e factors operating especially to cause the high typhoid rate in this county
pear to have been the insanitary conditions generally, and the density of
pulation in the towns and industrial settlements.

SANITARY MEASURES RECOMMENDED.

The measures especially recommended for the rural homes were (1) sani-
ry disposal of human excreta, (2) protection of water supplies from poten-
lly dangerous contamination, (3) protection of food from invasion by flies,
d (4) the prompt institution of rigid cleanliness at the bedside of cases
cognized as or suspected to be typhoid fever, or other infectious disease, and
cases of typhoid fever the prompt inoculation with antityphoid vaccine of
her members of the household.

Besides the inoculation against typhoid of persons in homes in which cases of
e disease had occurred, inoculation of the general population was advocated.
e vaccine for this work was furnished without cost to the citizens by the
ygienic Laboratory of the Public Health Service. The vaccine was adminis-
red by the county health officer and the practicing physicians of the county.
e practicing physicians, with one exception, did this work without charge.
the period of the survey over 5,000 residents of the county, the majority be-
g among those living in the industrial settlements, were inoculated.

In the towns and industrial settlements the measures especially recom-
ended were (1) the immediate installation of sanitary privy systems, with
lequate public scavenger services; (2) the installation or extension of water-
rriage sewerage systems as rapidly as practicable; (3) the installation or
tension and purification treatment of public water supplies; (4) frequent
d systematic removal and sanitary disposal of stable manure and other
fuse; and (5) screening and general cleanliness for all places and particu-
rly for those at which foods were sold or prepared for sale.

COOPERATION.

Active and hearty cooperation in the work was received from State and county health officials, the practicing physicians, the clergymen, the newspapers, from several business and civic organizations, from the administrative authorities of the incorporated towns, and of a majority of the industrial settlements, from the probate judge and other county officers, and from other prominent citizens generally.

The State board of health furnished the assistant State health officer as a member of the regular survey force. The State health officer visited the county on several occasions, advised with the officers making the survey, addressed public meetings, and otherwise helped the work in every way he could.

The county health officer was tireless, enthusiastic, and efficient in his efforts to further the success of the work in every way possible.

The practicing physicians in the county gave remarkably active cooperation. The writer in his experience has observed among local medical professions no better spirit in community welfare work than that manifested throughout the period of the survey by the practicing physicians generally of Walker County. They reported promptly, according to all evidence obtained, their cases of typhoid fever and of other infectious disease. They devoted hours, and in many instances whole days to the administration of antityphoid vaccine to the citizens—all with one exception doing this work free of charge. They actively cooperated with the county health officer and the other officers of the survey in trying to get carried out at the bedside of typhoid patients disinfection of excreta and other prophylactic measures. The county medical society indorsed and most of its members applied in their practice the use of fresh proteid foods for the cure and the prevention of pellagra. As an apparent result of their efforts actively begun in the fall of 1915, and of the propaganda of the county health officer, this disease was remarkably reduced. In the county in 1916 there were reported only 12 deaths from pellagra, as against 33 for 1915 and 30 for 1914.

The local newspapers gave excellent publicity to the work and, editorially, strongly supported the propaganda of sanitation.

The ladies and the business men of Jasper formed sanitation organizations which did much to further sanitary improvements in Jasper and its vicinity.

The town councils adopted and with more or less vigor enforced sanitary ordinances, with particular respect to cleanly disposal of human excreta.

The administrators of the industrial settlements cooperated in the investigation and a considerable proportion to the extent of having carried out the sanitary measures recommended.

RESULTS.

Country homes.—Groups of representative country homes were revisited to ascertain the degree of sanitary improvement accomplished subsequent to the first visit of the survey. The aggregate number of strictly country homes in the groups was 1,004. At 37, or 3.7 per cent of these homes, high-grade sanitary privies were found installed in the place of insanitary privies, and at an additional 20 (2 per cent) marked improvement was found in the methods of excreta disposal. At 5.8 per cent of the homes radical improvement had been made in the water supply. Considering the economic conditions at the vast majority of the strictly country homes in the county, this immediate result was far from disappointing (figs. 43–46).

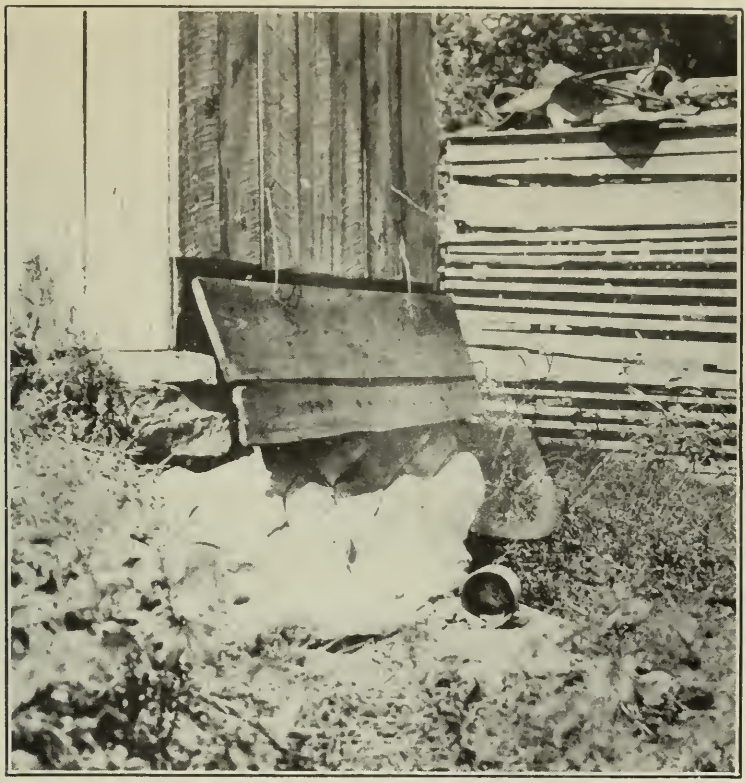


Fig. 41.—An insanitary privy within 500 feet of county courthouse in Jasper, Ala.

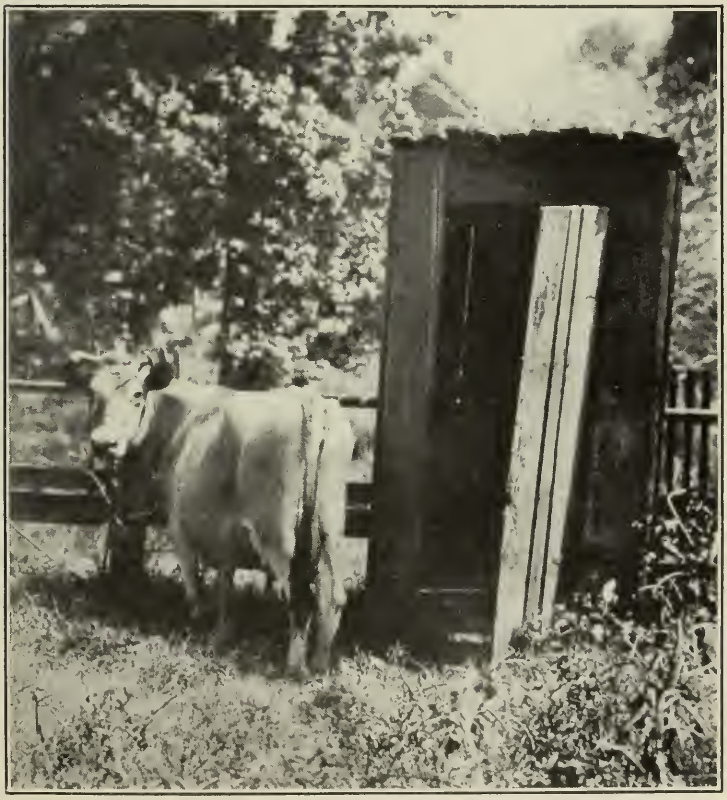


Fig. 42.—Insanitary privy in Walker County, Ala., with milk cow tethered near by and likely to get her udder soiled frequently with privy contents.

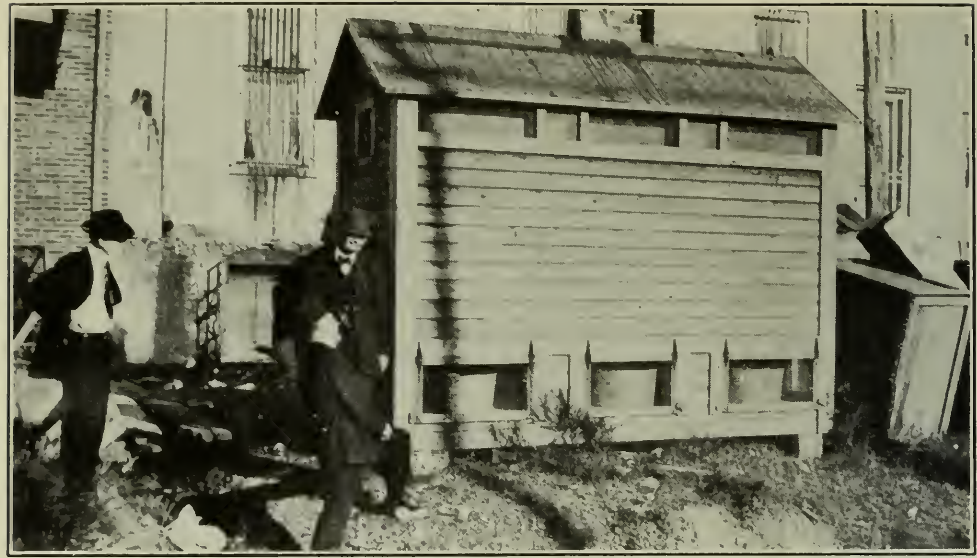


Fig. 43.—The first high-grade sanitary privy built after the sanitary survey in Cordova, Ala. The screened air vents at the bottom and top of the double back wall permitted good ventilation. This privy was for use of patrons of the town drug store and furnished an excellent demonstration.

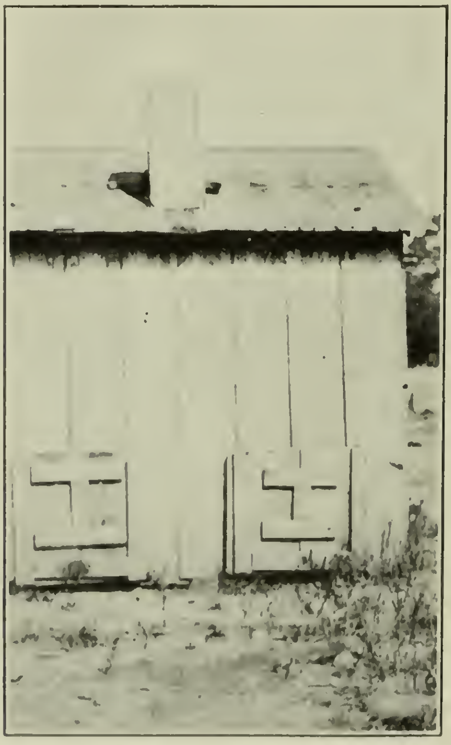


Fig. 44.—Back view of typical sanitary privy installed in mining camp at Townley, Ala.

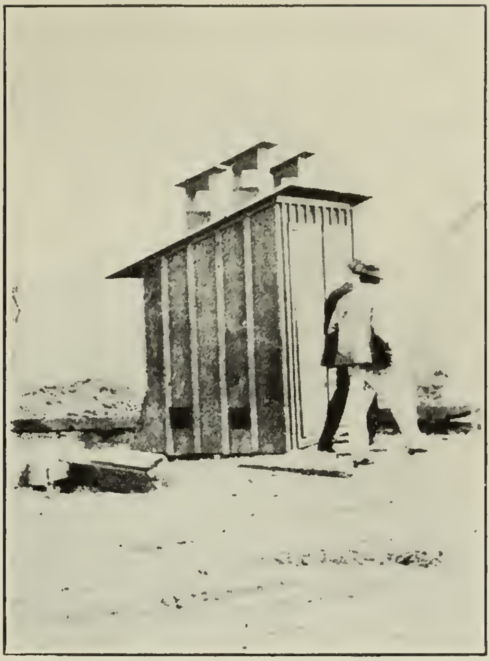


Fig. 45.—Side view of sanitary privies at mining camp in Townley, Ala.

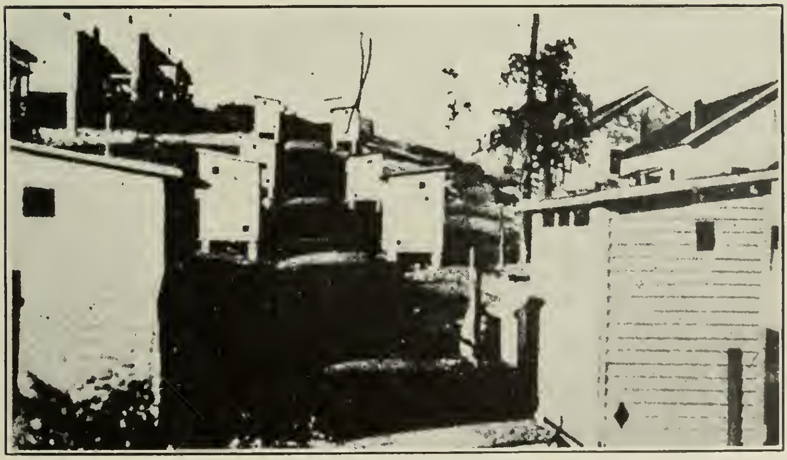


Fig. 46.—Clean alley in Indian Head cotton-mill village at Cordova, Ala. All privies provided with water-tight receptacles, screened air vents, and in all other respects sanitary.

Industrial settlements.—In the last few weeks of the survey period all of the homes (in aggregate, 2,295) in the industrial settlements were resurveyed. On this resurvey 838, or 36.51 per cent, of these homes were found to be provided with sanitary (A type) privies, the contents of which were carried away and disposed of in a sanitary manner by systematic scavenger service. Of these 838 homes, 394 had been found on the first round of survey to be provided with sanitary privies. Thus 444, or 19.35 per cent, of the 2,295 homes in the industrial settlements were provided with sanitary privies in the place of insanitary privies in the period of the survey.

The cotton-mill village and seven of the large mining camps at the end of the survey in the autumn of 1915 presented high-grade sanitary conditions in the most salient respects and thus furnished an excellent demonstration in this county.

It was disappointing that at the large saw-milling settlement, where an abundance of lumber was readily available for the reconstruction of privies, no progress in sanitation was made in the period of the survey.

Towns.—On the resurvey of the 2,105 town homes, the findings as compared with those of the original survey are presented in the following table:

Findings in incorporated towns.

Town.	On original survey.							On follow-up survey.						
	Total homes.	With water-closets.	With sanitary privies.	Total with sanitary disposal.	With insanitary privies.	Without toilets.	Total with insanitary disposal.	With water-closets connected with sanitary sewer.	With sanitary privies.	Total with sanitary disposal.	With insanitary privies.	Without toilets.	Total with insanitary disposal.	Number of homes equipped with sanitary devices in period of survey.
Jasper	583	233	38	271	281	31	312	233	335	568	15	.....	15	297
Carbon Hill	402	1	5	5	385	11	397	.....	25	25	376	.....	377	20
Cordova	364	1	132	133	222	9	231	1	357	358	6	.....	6	225
Dora	278	2	2	2	233	41	276	.....	263	263	15	.....	17	261
Townley	230	.....	100	100	111	19	130	.....	229	229	1	.....	1	129
Oakman	187	.....	5	5	164	18	182	.....	167	167	20	.....	20	162
Nauvoo	61	.....	14	14	40	7	47	.....	45	45	16	.....	16	31
Total	2105	237	296	530	1,436	136	1,575	234	1,421	1,655	449	.....	452	1,125

It will be noted that of the 1,572 homes which on the first round of survey were either without toilets or provided with insanitary privies—1,125, or 71.57 per cent—were equipped with sanitary privies in the period of the survey, and that at the close of the survey 1,655, or 78.67 per cent, of the 2,105 town homes had in practice sanitary methods of disposal of human excreta.

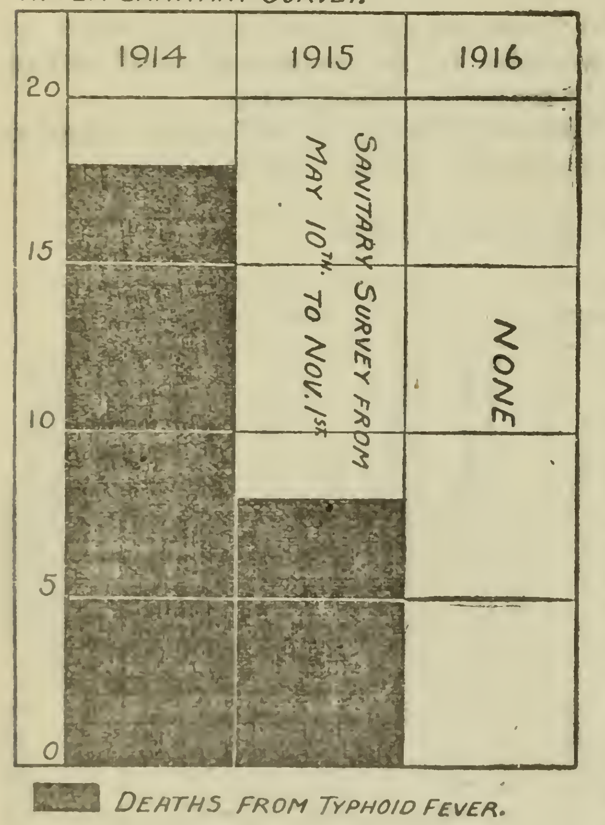
Besides the improvements in excreta disposal marked improvement in general cleanliness, screening, and water supplies were effected in the towns.

In the course of the sanitation of the privies in Jasper the box and flue device described in Public Health Bulletin No. 89 was originated. The adoption of this device, which might be designated the "Jasper sanitary privy," greatly facilitated the work in Jasper, as was subsequently the case in many other towns.

By November 15, when the period of observation for 1915 for the county was technically closed, it was estimated from accurately collected evidence that 2,592, or 37.07 per cent, of all the homes in the county were provided either with sanitary water-closets (234) or with sanitary privies (2,358). Thus Walker County, Ala., presented a considerable demonstration in the most salient feature of rural sanitation.

Typhoid fever reduction.—Apparently as a result of the sanitary improvements, typhoid fever (chart 12) and other diseases caused by filth-borne infection, underwent a wholesome reduction in Walker County. For 1915, the year of the survey, 86 cases of typhoid fever, with 8 deaths, were reported, as against 130 cases, with 18 deaths, for 1914, the year before the survey. In 1916, the year after that of the survey, only 48 cases (including suspected cases) were reported and not a single death from typhoid fever was reported. A considerable proportion of the cases in 1916 were in persons exposed to an infected ice-cream supply shipped from, and which at the same time was causing an extensive outbreak in, Birmingham, Ala.

CHART 12:- DEATHS FROM TYPHOID FEVER IN WALKER COUNTY, ALA. BEFORE AND AFTER SANITARY SURVEY.



The number of deaths recorded from "bowel troubles in infants" in the county was 57 for 1914, 51 for 1915, and 36 for 1916. The number of deaths from tuberculosis of the lungs also underwent a reduction. From this disease the number of deaths reported in 1914 was 46, in 1915 it was 41, and in 1916 it was 35.

Judging by the reports of deaths from all causes, which, according to all evidence obtained in the course of and subsequent to the sanitary survey in 1915, are as nearly complete as the death returns in most any statistical area, and certainly as nearly complete as those for any other county in Alabama, the general death rate in Walker County is remarkably low. The records for 1914, 1915, and 1916 are as follows:

Year.	Population (estimated).	Number of deaths from all causes.	Rate per 1,000.
1914	40,723	462	11.0
1915	43,238	464	10.77
1916	44,123	419	9.4

RESURVEY IN 1916.

In November, 1916, a rapid resurvey was made in Walker County. The report of findings, signed by Drs. Harrington and Grote, was as follows:

A second sanitary survey of Walker County was made by the United States Public Health Service in the first 15 days of November, 1916. The object of this survey was to ascertain the degree of improvement, if any, since the first survey in 1915, the permanency of the sanitation work which had been completed in 1915, and its effect upon the sickness rate. The survey was made by six officers of the Public Health Service, in cooperation with the county health officer and the sanitary engineer of the State board of health.

The results recorded, as a whole, are very gratifying. Where there is still much work to be done, especially in the rural districts and in the smaller mining camps, yet, as compared with other rural counties, a great deal has been accomplished. The greatest accomplishments have been in the more sanitary disposal of human excreta in the towns and in the larger mining camps of the county and in the knowledge of disease prevention, which was found to be general. There was found to have been a marked decrease in the incidence of typhoid fever and in the mortality of infants for the year 1916. In some of the towns and mining camps there had been a deterioration of the sanitary equipment installed in 1915, while in three of the towns and seven of the industrial camps conditions were improved. It is evident that the county health officer needs an assistant, as sanitary inspector, as it is impossible for him to perform the increasing duties of his office throughout the large territory under his jurisdiction.

The points of sanitation scored and their relative values were as follows:

	Per cent.
Excreta disposal (sewage)	50
Water supply	30
Screening	10
General cleanliness	10
Perfect score	100

The scores of the incorporated towns were:

Town.	1916	1915	Town.	1916	1915
Jasper	85.2	75.0	Dora	68.0	62.0
Cordova (includes cotton mill)	82.2	74.0	Oakman	66.9	59.0
Townley (includes mining camps)	73.0	74.15	Nauvoo	49.3	49.0
Carbon Hill	69.1	65.5			

The scores of the industrial camps and villages were:

Name and location.	1916	1915	Name and location.	1916	1915
Indian Head Mills, Cordova	93.5	87.2	Red Star (Bryan Coal Co.), Red Star	24.0	38.4
Alabama Power Co., Parrish	89.0	....	Calumet, Jasper, R. F. D.	25.5	....
Birmingham Fuel Co., Townley	86.3	82.0	Burnwell (Bryan Coal Co.), Burnwell	21.0	38.0
Bankhead Coal Co., Bankhead	75.4	77.0	Summit Coal Co., Dora, R. F. D.	23.0	....
Sunlight Coal Co., Sunlight	80.5	68.0	West Corona, Corona	19.9	28.1
Sloss Mines (Ivy Leaf), Dora	72.0	75.5	McCollum Mines, McCollum	18.4	18.0
Sipsey Mines, Sipsey	70.0	76.7	Big Ridge, America Junction	18.3	....
Black Diamond, Benoit	67.7	68.6	O'Rear's Camp, America Junction	18.0	18.0
Empire Coal Co., Empire	60.0	40.5	Drifton, Drifton	15.3	15.0
Barney Mines, Barney	48.1	28.1	Black Creek Coal Co. No. 1, Nauvoo	15.3	28.0
Manchester Sawmills, Manchester	40.0	47.6	Black Creek Coal Co. No. 2, Nauvoo	9.6	40.0
Corona, Corona	37.8	46.5	Galloway Coal Co. No. 11, Carbon Hill, R. F. D.	15.0	35.0
Patton, Patton	36.1	57.0			
Flat Creek (Pratt Co.), Flat Creek	28.0	28.0			
Dilworth, Dilworth	26.0	48.0			
Aldridge Mines, America	26.0	42.0			
Jagger Mines, Prospect	25.2	49.0			
Coal Valley (C., C. & I. Co.), Coal Valley	24.5	46.0			
Samoset (Bryan Coal Co.), Samoset	24.0	36.2			

NOTE.—The scoring for the year 1916 was more accurate. It must of course be remembered that no two men score the same.

During the limited time of this survey it was impossible to visit as many rural homes as was anticipated. However, 509 rural homes, in four different sections of the county were visited, inspected, and scored. Taking these homes as an average, there was an improvement of 9.61 per cent in the sanitary condition of the rural homes of Walker County. It is believed that this second survey impressed the people of Walker County with the earnestness of the Government in the work and will yield results.

Respectfully,

F. E. Harrington,
Assistant Epidemiologist, U. S. Public Health Service.
Carl A. Grote,
County Health Officer.

CONCLUSION.

In view of the area and the size of the population, it is impossible for any one man to perform all the health work promising effectiveness from continued effort in this county. If the permanent health force for the county could be increased by two or three whole-time sanitary inspectors, in order that constant surveillance over sanitary conditions in towns and industrial settlements could be maintained and the work among the isolated rural homes intensified, there seems not a reasonable doubt that Walker County, Ala., could soon be made a model in sanitation, and as such be a demonstration of vital and Nation-wide importance.

SANITARY SURVEY OF DALLAS COUNTY, IOWA.[1]

The sanitary survey of a county in Iowa, made in the summer of 1915, by the United States Public Health Service in cooperation with the Iowa State Board of Health, was undertaken for the purpose of determining (1) what the sanitary conditions of the county were, (2) the effect of these conditions on the health of the inhabitants of the county, and (3) the possibility of improving these conditions by the campaign of individual education which is made possible by the methods of work used in the survey.

Dallas County was selected for the work, after consultation with the State authorities of Iowa, because it appeared to offer conditions typical of the best agricultural sections of the State, and also to be convenient of access and well provided with facilities for transportation within the county.

The survey of Dallas County was begun June 14, 1915, and terminated November 1, 1915.

GENERAL CONDITIONS.

Dallas County lies between the forty-first and forty-second parallels of latitude, and is bisected by the ninety-fourth meridian of longitude. The county is approximately square, with an area of 575 square miles.

The general contour of the county is that typical of central Iowa, with series of rolling hills between narrow stretches of level prairie. The county is well watered by Beaver Creek and the Racoon River, the north and south branches of the latter crossing the county from northwest to southeast in parallels about 10 miles apart. The Des Moines River cuts across the northeastern corner of the county.

The soil is a deep black loam, almost universally rich and fertile. The greater part of the county (95 per cent) is in farm land, and a very large part (85 per cent) is under cultivation.

The climate exhibits the extremes of the upper Mississippi Valley, ranging from about 100° in summer to 30° to 40° below in winter. In general the winters are long and extremely cold and the summers short and hot.

The population in 1910 was 23,628, an increase of but 570 since 1900, the rural population decreasing slightly (0.4 per cent) in that time. Three-fourths of the population is native white, of native parents. Less than one-half of 1 per cent is colored, and only slightly more than 5 per cent are of foreign birth. Of the total population of 23,628 in 1910, 11,411 lived in the 14 incorporated towns and 12,217 lived in the unincorporated rural territory.

The civil divisions of the county consist of 16 townships, each approximately 6 miles square, arranged in four "tiers" of 4 townships each, and of 1 "city".

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[1] This section of the report covering the sanitary survey of Dallas County is, with some rearrangement and slight modifications, the manuscript of the report prepared and submitted by Epidemiologist A. W. Freeman soon after the completion of the survey of this county.

and 13 towns. The population of these divisions is given in the 1910 census as follows:

Townships and towns.	Population of incorporated towns.	Population outside incorporated towns.	Total population of township.
Adams Township		786	786
Adel Township:			
Adel	1,289		
Dallas Center	769	712	2,770
Beaver Township		777	777
Boone Township		692	692
Colfax Township		714	714
Dallas Township: Dawson	275	623	898
Des Moines Township: Woodward	712	1,596	2,308
Grant Township: Granger	225	633	858
Lincoln Township		721	721
Linn Township: Linden	315	668	983
Spring Valley Township, Perry City	4,630	704	5,334
Sugar Grove Township, Minburn	388	794	1,182
Union Township:			
Dexter	767		
Redfield	659	950	2,376
Van Meter Township:			
De Soto	356		
Van Meter	386	793	1,535
Walnut Township: Waukee	340	661	1,001
Washington Township		693	693
Total	11,111	12,517	23,628

The principal occupation of the inhabitants of Dallas County is agriculture. The coal mines of the northeast corner give employment to several hundred men, most of them brought into the county for the purpose, and in the towns of Perry and Adel there are certain manufacturing industries, but for the most part this county is a county of farmers, and the industry of the county primarily and fundamentally is agriculture.

According to the census of 1910, there were in the county on April 15 of that year 2,446 farms, a decrease since 1900 from 2,607. These farms were of an average size of 145.6 acres, of which 124.4 acres were improved. The total value of all farm property at that time was $45.819,944, an increase within 10 years of 123.8 per cent. The value of the land in 1910 was $35,542,263, an increase of about 150 per cent in 10 years. The average value of all property per farm in 1910 was $18,773, and of land alone was $16,442. The average value of land per acre was $99.79.

The value of all crops produced in 1910 is given as $3.631,651, of which $2.823,035 was in cereals alone, corn, oats, and wheat being the principal crops. In 1910 the receipts from cattle, butter, milk, poultry, and eggs sold amounted to an additional $3,000.000, making the total value of farm products reach about $6.500,000.

In addition to its agricultural resources, the county possesses valuable deposits of coal which are being actively worked in the valley of the Des Moines River. The coal, while not of high quality, is abundant in quantity, and there are in operation a number of mines employing several hundred men and supporting several thousand people.

It will be seen, therefore, that in the value of the land, and in the value of crops and other farm products, the county represents the very best of rural economic conditions. The people are almost without exception prosperous and well to do. Poverty outside the towns is almost unknown, and the living and housing conditions of the people are limited practically only by the desires of the population.

The striking features of the economic and social features of the county are) the very large percentage of tenant farmers, reaching 41 per cent in 1910 d still higher in 1915, and (*b*) the large number of towns of less than 1,000 pulation. These factors influence the sanitary as well as the social and onomic conditions in the community life.

PLAN AND SCOPE OF SANITARY SURVEY.

The survey was made by officers of the United States Public Health Service, th the assistance and cooperation of the Iowa State Board of Health. The rce consisted of two assistant surgeons and four medical-student assistants, der the general supervision of the epidemiologist of the Public Health Serv-. Two of the student assistants were furnished by the Iowa State Board Health, the remainder of the force being furnished by the Public Health rvice.

The survey was begun on June 14, and was practically completed by October the work done after that time being almost entirely for the purpose of dermining the effect of the work previously done.

The method of work was comparatively simple. The force, divided into two rking parties of three men each, traveled in automobiles. The farms were sited by townships, working one party to a township, and visiting every rm. Each farm was visited by only one inspector, three farms being visited nultaneously by the members of one working party.

The visit to a farm usually occupied about 20 minutes, and each working rty normally visited about 45 homes per day, an average of 15 a day for each n. Wherever possible the interview was held with the man of the place, but his absence the wife or other responsible person was interviewed. While the ture of the interview varied somewhat with the personality of the inspector d that of the person interviewed, the general course was similar in all. This nsisted of an explanation of the purpose of the visit, the collection of the cessary information regarding the family and the prevalence of disease, and inspection of the sanitary features of the premises, particularly of the well d the privy. In this inspection every effort was made to get the householders join. While inspecting the sanitary features of the premises, the underlying cts regarding the prevalence of disease and the reasons for making the anges indicated were carefully explained to the householder, and every argunt possible used to induce him to realize their importance.

In the work with the farmers emphasis was laid principally on the well and e privy as sources of infection, since measures to provide safe water supply d cleanly disposal of human excreta are the fundamental and rudimentary ps in sanitation which must precede any more advanced action, and since ese fundamental factors in the sanitation of the farm have been found most eding improvement.

The inspection of the premises was as thorough as conditions permitted. was confined to those conditions affecting health which lie outside the dwellg house itself.

The reception accorded the inspectors, while it varied widely with the charteristics of the individual farmer, was for the most part cordially receptive. me few individuals (at only 10 of all the homes visited) absolutely refused permit any inspection of their premises or to engage in conversation on the bject. In some cases this attitude appeared to be from religious motives, d in some cases from an exaggerated idea of the rights of the individual.

The information collected at each farm was recorded on a card numbered rially. The cards for each township were filed separately and numbered consecutively. These cards were turned in at the end of the day, filed systematically, and tabulated and studied as opportunity permitted.

The method of work in the towns varied somewhat with the size of the community. In all of them all homes were inspected. In the larger towns suggestions for sanitary improvements were directed at the community rather than at the individual.

The inspection cards for the towns were filed by towns, and as soon as the inspection was completed the cards were tabulated and a report prepared on the sanitary conditions as found, with recommendations for a system of community improvement. This report was presented at the first meeting of the town council and immediately published in the town newspapers. Following the publication specific recommendations for improvement were made before the town council, and where boards of trade or commercial clubs existed were presented to them for indorsement.

In addition to the individual presentation of the subject, secured by visiting every home in the county, general methods were used wherever possible. Public meetings were held in every town, usually in the form of a union meeting at some church. The assistance of the local pastors of each town was invoked, and they usually consented to combine their congregations in a union meeting at some one church on Sunday evening. At these meetings the subject was presented in the most effective way possible, every effort being made to enlist the support of the people in a campaign of improvement. Lectures were given before 26 such public meetings, with an average attendance of 100.

The daily and weekly papers of the county were utilized as fully as possible, both by news stories and special articles. All town reports were published in the newspapers, and all other information or news which could be gotten into suitable shape.

By these means the introduction of the workers to the people of the county was much facilitated and much public interest and cooperation was aroused. No one within the limits of the county could remain ignorant of the purpose of the work and the reasons for its performance.

The number of county dwellings covered by the survey was 2.409, and the number of dwellings in incorporated towns surveyed and canvassed was 3,555.

In September and October 500 homes selected as fairly representative of all the rural homes in the county were revisited to ascertain the degree of sanitary improvements which had been effected by the educational work.

FINDINGS IN RURAL SECTIONS.

The rural survey comprised a visit of inspection to a total of 2,409 homes. The census of 1910 found 2.446 rural dwellings in the county, but the number had decreased from 2,607 during the preceding 10 years, and the number visited probably represents the total number of rural homes in the county with the possible exception of one or two remote from the public road which were not seen. The occupants of 275 homes, slightly more than 10 per cent, were not at home at the time of the visit. Most of these homes were inspected, even in the absence of the occupants, and full information regarding many of them was obtained from the nearest neighbor.

Ownership of dwelling.—Of the 2,409 homes inspected information as regards ownership could not be obtained for 225. Of the remainder 53 were vacant, leaving a total of 2.131 regarding which information was collected. Of these 2,131 homes 1.158 (54 per cent) were occupied by their owners and 973 (46 per cent) were occupied by tenants. Assuming this figure to be true for the remainder regarding which information was not available, it represents a decrease of occupant ownership from 57 per cent in 1910 and from 61 per cent in 1900.

Popular attitude toward the work.—At 2,144 homes the attitude of the householder toward the work, as judged from his conversation and actions was recorded. At only 10 of the houses visited (0.5 per cent) were the householders opposed; at 75 homes (or 3.5 per cent) they seemed indifferent; at 1,059 (or 49.4 per cent) they showed interest, but did not agree at once to make the suggested improvements, while at 1,000 homes (46.6 per cent) they agreed at an early date to make improvements suggested.

Number in household.—The number of persons in 2,262 homes at which the number in the household was enumerated was 9,393. Thus, the average for each home in the rural section of the county was 4.2.

Age and sex.—The age and sex of the 9,393 persons enumerated were as follows:

Sex.	Age periods.			All ages.
	Under 10.	10 to 19.	20 and over.	
Males	1,175	909	2,718	4,802
Females	1,152	907	2,532	4,591
Total	2,327	1,816	5,250	9,393

Number of rooms to house:	
With 1 room	6
With 2 rooms	11
With 3 rooms	79
With 4 rooms	228
With 5 rooms	348
With 6 rooms	632
With 7 rooms	397
With over 7 rooms	631
Not stated	77
	11

Construction of house:	
Brick	27
Frame	2, 296
Stone	1
Cement	4
Not stated	81
	2, 409

General appearance of residence.—The average farm dwelling in Dallas County is a substantial frame structure, well painted, and kept up with considerable care and pride. The general appearance was recorded as good for 1,652 of the homes, for 475 as fair, and for 79 as poor. For 103 homes this datum was not recorded.

General cleanliness.—The general cleanliness was recorded as good at 1,924 homes, fair at 328, poor at 67, and for 90 homes this datum was not recorded.

Cellar.—Four hundred and seventy-six dwellings had cellars, 1,706 had none, and for 227 this datum was not recorded. On 62 of the premises there were "dugouts" in the yard. These were used as a cooling place for perishable foods and also for possible refuge from cyclones.

Screening in summer.—At 1,798 homes the screening of dining room and kitchen was complete, at 489 the screening of dining room and kitchen was incomplete and served as a means to exclude probably 50 per cent of the flies seeking admission. At only 51 (or 2.14 per cent) of the homes was there no screening of dining room or kitchen, and at 71 the presence or absence of screening was not recorded. Thus the lessons carried by the widespread agitation against the fly have evidently been well learned by the Dallas County citizens.

Topography.—One hundred and forty-six of the home premises were on rolling ground, 77 were on hilly ground, 1,453 on sloping ground, and 708 on level ground. For 25 premises the topography was not recorded.

Animals on premises.—At 2,209 of the country homes cows were kept, at 2,231 horses, at 2,265 poultry, at 2,136 hogs, at 1,844 cats, and at 1,997 dogs.

Stable manure.—In spite of the increasing amount of attention being given to the prevention of fly-breeding, there was apparent little or no effort on the part of Dallas County farmers to prevent the breeding of flies in stable manure. The usual practice found was to allow the manure to accumulate in the barnyard during the summer and winter, and to haul it out and scatter it in the spring and fall. No covered or screened manure bins were seen. Note regarding manure was made on 2,084 farms. In 560 of these the manure was removed monthly during the summer. In the remaining 1,524 it was moved not more frequently than twice a year.

Disposal of human excreta.—Definite data on the type of toilet in use for the collection and disposal of human excreta were obtained for 2,400 households. Of the number, 74 were provided with water-closets connected with private sewers, 2,282 had outdoor privies, and 44 (or 1.83 per cent) had neither privy nor water-closet.

Of the 74 homes having modern plumbing systems, at 40 the water-closets were connected with septic tanks, and at 34 with cesspools. At about 50 of these homes the disposal of sewage appeared sanitary.

The 2,282 privies were classified as follows: "A" type, 15 (proper sanitary privies having a water-tight vessel and fly-proof box, regularly scavenged); "B" type, 12 (privies having a water-tight vessel to prevent soil pollution, but not of fly-proof construction); "C" type, 173 (privies screened against flies, but having no vessel to prevent soil pollution); "D" type, 1,774 (privies preventing access of barnyard animals, but accessible to flies—in this case mostly pits in the ground); "E" type, 304 (grossly insanitary open-back privies, soil polluting, and accessible to all barnyard animals and flies). For 4 privies the type was not recorded.

The type of privy most used, and classified as "D" type, was found to consist of a hole in the ground about 6 feet deep, usually without lining of any kind, over which the privy house was set. The back of the house usually reached to the ground, and chickens and domestic animals were excluded. The seat holes were uncovered, but as the interior of the pit was usually dark, flies in very large numbers were not as a rule seen about the privies. The contents of the pit leaked into the ground, the solid matter gradually filling the hole. When the hole became full, a new pit was dug, and the contents of the old hole covered over with earth. In the farmyard a number of depressions marking former sites of the privy were usually to be seen. This type of privy, while not so potent in producing typhoid fever as the open-back privy common in certain parts of the country, results in soil pollution of the grossest kind, and not infrequently this is enough to reach and pollute the well. The type of privy commonly in use, therefore, was nowise in keeping with the other living conditions of the citizens, and constituted a very grave and real danger to the health of the rural communities in the county.

The contents of 260 privies were noted as accessible to chickens and other domestic animals, and in 186 instances as likely to get into the garden, truck patch, or fruit ground. The contents of 304 "E" type privies were exposed freely to flies invariably, and to larger animals frequently. These privies constitute a positive and active menace to the farm on which they are found, and to a less degree to the entire neighborhood. The privies were noted by the inspectors as being cleaned as follows:

When necessary	1, 536
Regularly	97
Annually	184
Never	175
Not stated	290
	2, 282

The disposal of the contents of the privies was recorded as follows:

Buried	1, 681
Fertilizer	38
Not stated	563
	2, 282

At about 50 per cent of the homes provided with privies, the privy was not used by the men and larger boys on the place, stables and other outbuildings being used by them instead.

Water supply.—The almost universal source of domestic water supply in Dallas County is the shallow well. At 2,252 farms the following record was made of the source of water supply:

Farms with wells	2, 112
Farms with cisterns	79
Farms with well and cistern	16
Farms with springs	39
Farms without supply	6
	2, 252

Of the wells, 268 were located down slope from the privy and 265 down slope from the stable. In most cases wells so located were down slope from both stable and privy. It will be seen, therefore, that the location as regards drainage of about 12 per cent of the wells of the county was radically wrong.

The distance of 2,001 wells from the farm privy was recorded as follows:

Within 50 feet of the privy	82
50 to 100 feet	420
100 to 200 feet	975
Over 200 feet	524
	2, 001

The distance of 2,000 wells from the nearest stable was recorded as follows:

Within 50 feet of stable	127
50 to 100 feet	360
100 to 200 feet	833
Over 200 feet	680
	2, 000

From the foregoing table it will be seen that almost exactly 25 per cent of the wells were located within less than 100 feet of the privy, 4 per cent being within less than 50 feet of the privy. In view of the construction of the majority of the privies, which permitted the grossest soil pollution, these figures indicate a situation of potential danger. About 25 per cent of the wells were located within 100 feet of the stable, and about 7 per cent within less than 50 feet. While the stable pollution is not as actively dangerous to health as that from the privy, the close proximity to the well of the heavily polluted soil about the stable could not be regarded as either safe or desirable.

Eight hundred and eighty wells were dug, 1,168 were drilled, and 47 were driven wells. For 17 wells the character was not recorded.

Eleven wells were less than 10 feet deep, 241 were between 10 and 25 feet deep, 664 were between 25 and 50 feet deep, 638 were over 50 feet deep, and for 558 the depth was not recorded. Two thousand and forty-eight wells were equipped with pumps, 22 with buckets, and for 42 the equipment was not recorded. One thousand one hundred and forty-two wells had tight platforms, and 1,165 had water-tight curbing.

From the above it may be seen that the wells of the county, notwithstanding the fact that they were practically the sole source of domestic water supply, could not be considered in satisfactory condition. One-fourth of the wells were located too close to the stable or privy or both. One-eighth were less than 25 feet deep, a depth which must be considered the lowest possible limit for safety in such a soil. The equipment was remarkably good, since the sight of an open well with the old-time bucket was so rare as to cause comment. Nearly 99 per cent of the wells had the protection afforded by the use of a pump instead of a bucket. About half of the wells had tops which were so leaky as to permit the entrance of dirt, filth, and possible infection about the top of the well. Little more than half were properly curbed. In 10 per cent of the wells there was drainage to the soil immediately about them from the stables, and in 7 per cent from privies.

Of the 39 springs found in use most were "spring wells" rather than springs in the true sense. Eight of the 39 were down slope from a privy and 11 were down slope from a stable. The distances from the nearest stable and privy were as follows:

Distance from privy:

0 to 50 feet	0
50 to 100 feet	1
100 to 200 feet	6
Not stated	4
	11

Distance from stable:

0 to 100 feet	0
100 to 200 feet	6
Over 200 feet	25
Not stated	8
	39

Twenty-six springs were properly curbed, 13 were not properly curbed. Twenty-six were piped so that vessels did not have to be dipped into them, 13 were not. Only 12 of the 39 were properly ditched to shed water.

Of the 79 cisterns inspected, a large majority were found to be in excellent condition.

Rural villages and industrial settlements.—In the several residential villages in the rural sections of the county sanitary conditions were found to be about the same as those obtaining at the isolated country homes.

Four coal mines were in operation at the time of the survey, with their atendant camps for housing the operatives. The sanitation at these camps vas, in comparison with that of near-by farm homes, good in one instance, oor in one instance, and fair in two instances.

In the four coal-mining camps the aggregate number of homes was 274. The vater supply at these homes was regarded by the investigator as safe for 81, nsafe for 101, and of doubtful quality for 92. One hundred and eighty of the omes were provided with privies of "D" type, 82 with privies of "E" type, nd 12 had no toilets of any kind.

Schools.—The school system of the county lacks centralization. Each townhip is a separate taxing district, and each incorporated town a separate taxng district, there being all together 46 separate taxing districts in the county. n addition, each school has a separate board of control, which has charge of he building and grounds. All together there are approximately 150 separate oards in charge of the school buildings and grounds in the county.

The towns in the county had, without exception, modern, well-built, and saniary schoolhouses, practically all equipped with fairly satisfactory systems of xcreta disposal and with good water supplies.

The country schools, however, of which there is one every 2 miles in the ounty, were of uniformly unsatisfactory type as regards size, lighting and entilation, water supply, and excreta disposal. There were approximately 132 ural one-room schools in the county. The standard type, from which there was ittle or no variation, was a one-room, white painted building, with a little ntry or vestibule at the front door. The lighting was from two sides, and ften there were windows in the front of the school as well. Heating was sually by a coal stove, and ventilation only by opening the windows. The ater supply was from a well or cistern on the school grounds, or from the well f some neighbor. The privies were usually of the pit type, in bad repair, xposed to flies, and frequently not affording complete privacy.

The interior of the schoolrooms, as far as could be determined from an inpection made during vacation, was usually clean, curtains being frequently ound at the windows, and other evidences of the efforts of the teachers and upils to improve the appearance of the school.

In view of the limited time available for work after completion of the rural urvey, it was impossible to take up the matter of improving the sanitation of he rural school with the individual school boards. Until the county system or he State provides for some more centralized form of government, conditions ound in regard to the sanitation of schools can be expected to continue.

Churches.—One of the striking features of the rural life of Dallas County s the absence of country stores and churches. The mercantile life of the ounty has apparently centered exclusively in the towns, and the churches seem o be following suit. The town churches appear to be vigorous and in a ealthy condition, while the rural churches, for the most part, were somewhat eglected and in poor repair. Most of them had no water supply, and the ethod of excreta disposal was insanitary. While the privy at the church ay not be used much, it constitutes a menace to health if not properly contructed and operated, and had time permitted effort would have been made to ecure the sanitation of some at least of the rural churches.

County health administration.—The sanitary administration of Dallas County, ike that of all counties in the State of Iowa, is widely decentralized. There is no county board of health or county health officer. Each township and each town has its own health officer, who may or may not be a physician. These health officers are paid either very small salaries or most frequently serve without pay, and, while nominally possessed of broad powers, in reality affect the sanitary situation to an almost negligible degree. With the exception of the quarantine of the major infectious diseases, no evidence of the activity of the health officers was encountered during the course of the survey. The State board of health, while possessing wide powers, was so handicapped by lack of funds that its agents seldom visited the county, and its orders as a consequence were more honored in the breach than in the observance.

Sanitary rating.—At 2,144 of the rural dwellings a score was estimated and recorded on excreta disposal, water supply, screening, and general cleanliness. The average sanitary rating for these dwellings was 69.54 per cent. Three homes were scored under 10, 1 between 10 and 20, 21 between 20 and 40, 219 between 40 and 60, 1,437 between 60 and 80, and the remainder 80 or over.

SUMMARY OF RURAL SURVEY.

In summing up the results of the rural survey of Dallas County, it may be noted that the economic and social conditions of the county are such as to permit almost the entire population to live under the very best of sanitary conditions and to enjoy every factor of health protection which modern science can offer. That they do not do so is due rather to their lack of desire for such improved conditions than to any real obstacle in the way of their attainment.

Community measures for health protection in the county are conspicuous principally by their absence, and individual measures are at most haphazard and incomplete.

While it is true that the sanitary conditions of the county were in general far better than those of the average county in the United States, these conditions should be compared, not with those of other counties, but rather with those conditions which are easily within reach of the people of the county.

Housing.—The housing of the people of the county is in general good. The houses are large and substantial and for the most part well kept up. The extremes of temperature encountered in the county, however, would seem to indicate that building materials other than the universal wood would be far better suited to the homes of the county, being cooler in summer and far easier to heat in winter.

Water supply.—While most of the people of the county have given a certain amount of attention to the subject of protecting their water supplies from contamination, there remain a large number to whom the matter has never appealed as of sufficient importance to warrant any particular attention. About half the wells in the county need radical improvement in location, construction or equipment, to render them safe. The response of the people to suggestion regarding the improvement of water supplies, however, was most marked.

Excreta disposal.—The conditions surrounding the disposal of excreta in the county were far from satisfactory and by no means in keeping with the economic status of the community. There were but few farms in the county which could not afford a system of running water with water-closets in the house and private sewage-disposal systems. While such systems were beginning to be installed in considerable numbers, they were being installed usually from reasons of convenience rather than of health. At the time of the survey the people of the county were far from realizing that the privy was a source o any particular danger or that it was worthy of any especial attention at their hands. The most difficult part of the work was to interest them sufficiently in the subject to induce them to talk and think seriously of the privy as a potential source of danger and a menace to health. The response to suggestions regarding changes in the privy indicated that while there were many who seemed indifferent, even after the most pressing representations on the subject, many were sufficiently interested and impressed immediately to begin the improvement.

Screening and manure protection.—The evident interest taken in the subject of excluding flies from kitchens and living rooms showed the effect of the prolonged and vigorous campaigns which have been waged against the fly in recent years. The subject of manure protection is so difficult of solution that many of the farmers were rather skeptical as to the practicability of any measures for the prevention of fly breeding on the average farm. The use of a manure spreader, into which the manure is thrown directly from the stable and which is hauled to the fields immediately after becoming filled, seems to be the only practical solution of the difficulty and is gradually coming into use. As this is excellent practice from the agricultural as well as sanitary standpoint, it will probably soon be almost universally in use.

Tenantry.—One of the most striking and important aspects of the sanitary, as well as of other conditions of life in the county, is to be found in the gradual but very definite increase in the amount of tenantry. The tendency for the farmer who has accumulated a considerable amount of money and whose children are grown or nearly so seems inevitably to be toward the town. The renters of the county living on the farms from which the original owners have retired are for the most part prosperous and content. That agriculture will not suffer from absentee ownership here as elsewhere can not be expected. From the sanitary standpoint the subject is of great importance. The tenant has nothing of the personal pride in the building up of the farm buildings which are the possession of another. He is to be on the farm a few years at most and can not be expected to make any permanent improvements for the future benefit of the owner. The owner, on the other hand, has but little interest in the place, except to see that the land is not abused and that the largest possible rental is forthcoming. He expends, therefore, the smallest possible amount in improvements, and that amount on those features which can be expected to increase the rental value. The difference in the appearance of places farmed by their owners and those farmed by tenants was usually striking.

Popular sentiment.—The attitude of the citizens indicated most strongly that the people of any rural district can be interested in sanitation to the extent of improving a very large number of their farms, and that they welcome any inspection or educational methods which are conducted with a proper regard for their rights and feelings. The resistant minority was not as large as had been expected, and the number opposed to the work in toto was surprisingly small.

Had means been available for continuing the work, revisiting the homes of those promising improvements and aiding those who desired additional advice, there seems no doubt that the farms of the county, with very few exceptions, could be put into excellent sanitary condition. The short period covered by the work is hardly sufficient to determine the actual benefit done, since the rural population is by habit and tradition much slower in reaction to such movements than an urban population of equal size.

There seems no reason to doubt, however, that the results of the work done in the summer of 1915 will continue to grow and that a permanent impress will be left on the sanitary life of Dallas County.

FINDINGS IN TOWNS.

The aggregate number of homes surveyed in the towns was 3,555. Of these homes 1,591 were furnished with water from sources away from the premises. Of the 1,964 water supplies obtained from sources on the home premises, 1,005 were regarded by the investigator as safe, and 959 were regarded by the investigator as unsafe.

Of the 3,555 homes, 691 were provided with water-closets, 2,736 with privies, and 128 were not provided with toilets of any kind. Of the 691 water-closets, 628 were connected with public sewerage systems, 24 discharged into septic tanks and 39 into cesspools. Only 10 of the 2,736 privies were of strictly sanitary type.

Upon the completion of the survey of each incorporated town, a report of findings, with recommendations, was made to the town council.

Reports submitted to town councils.—The reports submitted to the respective town councils for the seven principal towns were as follows:

(Perry.)

As a part of the sanitary survey of Dallas County recently completed by the United States Public Health Service in cooperation with the Iowa State Board of Health a survey of sanitary conditions in the city of Perry was made. This comprised a visit of inspection to every home in the city, a general study of the sanitary environment of the city, and an accurate record of the findings.

By reason of its location, size, economic prosperity, and civic spirit, Perry offers unusual opportunity for the development of sanitary conditions approaching the ideal. That it does not at present have these conditions must be admitted by any impartial observer. The purpose of this report is to present to the city authorities and citizens of the city a summary of the findings as to present conditions and certain recommendations looking to improvement.

During the course of the survey visits were made to 1,355 homes and other buildings occupied by human beings in the city. This included practically every house in the city, except the built-up business blocks in the center of the city. At each place visited careful notes were made as to the general sanitary conditions, the supply of water used for drinking and domestic purposes, the methods of disposing of human excreta, and the prevalence of typhoid fever in the family.

Typhoid fever.—The best index of the general sanitary conditions of any community in the United States is to be found in the prevalence of typhoid fever. Typhoid is a disease which depends for its spread upon improper or careless methods of disposing of human excreta. Its prevalence, therefore, indicates accurately the perfection of disposal of this matter, which is the most fundamental and important of all sanitary procedures.

The figures collected in the sanitary survey must be recognized as only a part of the typhoid which has actually occurred in Perry during the time under consideration. Many persons who might have had typhoid fever while in Perry have removed to other places, so that the number collected represents only those persons who have had typhoid in Perry and are still here. In addition, it is a fact that many persons who have had typhoid will deny the fact when questioned. The figures presented, therefore, are not given as a complete or accurate report on typhoid fever in Perry. They represent only the cases of typhoid of which records are available at this time.

The number of cases of typhoid occurring in Perry is given by decades and by years since 1910, as follows:

Prior to 1860	1
1860–1870	1
1871–1880	4
1881–1890	2
1891–1900	30
1901–1910	28
1911	6
1912	5
1913	12
1914	13
1915 (to date)	4
Total	106

While the total number of cases for the period under consideration is not excessive, the increase in the number of cases within the last decade, especially the very large number of cases occurring in the five years since 1910, should be a matter of concern to all citizens. This increase, of course, corresponds to the period of growth and indicates clearly that the growth of the town must necessarily be accompanied by an improvement in sanitary conditions if the health of the town is to be preserved.

In addition to the 106 persons now residing in Perry who have had typhoid fever, there are at present in the town 90 persons who have had typhoid fever at some other place, but are now residents of Perry.

The presence in Perry of 13 cases of typhoid during 1914 and 12 during 1913 indicates more clearly than the results of any inspection the need for improvement in the fundamentals of sanitation in the city. At the same ratio such prevalence in a city the size of Des Moines would be regarded as almost epidemic in proportions.

Water supply.—The town is exceedingly fortunate in possessing a water supply which is adequate for its needs, is accessible to almost every lot, and is of excellent sanitary quality. It is exceedingly unfortunate that the hardness of the water and the occasional occurrence of algæ in the water during the hot months renders its use so disagreeable that at the present time 272 premises are supplied from private wells or cisterns. Twenty per cent, or 1 in 5, of the premises in the city, therefore, are not supplied with water from the public supply, and the inhabitants of these premises are exposed to the dangers of polluted water from the private supplies. Many of these private supplies are on premises to which city water is available and in numerous cases are on the premises actually connected with the public supply. The first essential of health in any community like Perry is that all citizens receive a supply of water of the best sanitary quality. This can only be attained by the use of the public supply.

Before the city water is in universal use, as it should be, it is essential that it be not only pure and abundant, as at present, but soft and always palatable, as it is not at present. The first step to be taken in connection with the water supply should be in the direction of securing a supply much softer than at present. This may be secured through the installation of a water-softening plant at the present waterworks, or it may be necessary to secure an entirely new supply. Upon this point it will be necessary to secure good engineering advice.

The advantages of a soft-water supply are so obvious as to need but little argument. The annual expenditures for soap to soften the present water so that it may be used for laundry purposes constitute a sum almost equal to the cost of installing a softening plant. Distributed as it is among so many families, this expenditure is not evident, but that it is a waste of large proportions is a fact. In addition to the saving of soap, the installation of a softening plant should result in many new water connections by people who do not use the present water on account of its hardness and would add considerably to the revenue of the waterworks.

In addition to the installation of a water-softening plant efforts should be made to prevent the growth of algæ in the water during the hot months. It is probable that this growth takes place in the standpipe and could be readily prevented by the use of copper sulphate at intervals, in the manner now well recognized. Whether this is the case or not, it is certain that the growth can be prevented by some such simple means, and the exceedingly disagreeable taste and odor which the water has in hot weather could be easily avoided.

As soon as the water has been freed from its present disagreeable features efforts should be made to secure connection of every lot to which the water is available with the public supply. This should be made compulsory, if necessary, and as soon as practicable every private well on a lot to which city water is available should be closed and filled up.

Private wells.—There are at present within the limits of the town 272 sources of water for domestic use other than the public water supply. These are classified according to their character and to their protection against the entrance of filth about the top, as follows:

Character of supply.	Total number.	Number properly protected.	Number not properly protected.
Dug wells	88	49	39
Bored wells	71	47	24
Drilled wells	14	9	5
Driven wells	70	50	20
Cisterns	29	19	10
Total	272	174	98

The presence within the limits of the city of so large a number of shallow private wells is in itself a sanitary factor of great importance. The soil of the city is so heavily polluted that any well within the built up sections of the town must be looked upon with suspicion. When we confront the fact that of the 272 wells one-third, or 98, are not properly protected, it will be seen that the situation is exceedingly dangerous. The average distance of the well from the privy on the same lot is 104.3 feet. The average depth is 31 feet.

Excreta disposal.—Closely linked with the question of water supply and of equally great importance is the matter of disposing of human excreta. Human excreta constitute the greatest single menace to health with which we come into daily contact. They are the only source of the infectious agent of certain diseases, notably typhoid fever, the most important factor in the mortality of infants, and their dissemination in the community, resulting in the pollution of water and foods with them, affects unfavorably the general health of the whole population. The community which properly disposes of its excreta is practically free from danger of typhoid fever, diarrhea and dysenteries, and from Asiatic cholera, and in addition enjoys much better general health than one which is careless and permits their general dissemination.

Perry is exceedingly fortunate in possessing an extensive and satisfactory sewer system. It is exceedingly unfortunate that there still remain on the 1,355 premises inspected no less than 780 insanitary closets. Many of these closets are on premises which are furnished with running water and have a water-closet connected with the sewer. These closets are classified by the inspectors as follows:

	Number.
Sanitary out-door closets	0
Nearly sanitary closets	0
Closets with water-tight vaults or receptacles, not screened against flies or with earth vaults screened against flies	32
Closets with earth vaults not screened against flies	730
Open insanitary closets not screened against flies and accessible to domestic animals	22
Closets not classified	4
Total	788

The presence within the limits of a city as closely built up as Perry of so large a number of insanitary privies constitutes a serious situation which should receive immediate consideration. Of these privies at least 752 are not screened against flies, and at least 752 are so constructed that their contents go immediately on or into the soil.

The fly nuisance is in itself exceedingly important. While the small number of horses kept within the town tends to limit the number of flies, they are present in sufficient numbers to constitute a vehicle for carrying the filth from the numerous privies open to them into the homes and to the food of the citizens. Even the cold summer just passed permitted the breeding of multitudes of flies, and they are to be found in every house in the city at one time or another. These flies have all had access to filth and most of them are constantly soiled with it.

The pollution of the soil by 752 privies, which are cleaned only at irregular intervals, and the contents of which go on or into the soil, results in a widespread pollution of the soil so serious that no shallow well within the limits of the town can be considered as safe. Analysis of the water of a number of wells, whose tops are properly protected, showed in a majority of cases the presence of organisms of intestinal origin. This will in all probability be found to be true of a majority of the private wells in the city.

The remedy for this condition is so obvious as scarcely to need mentioning. Every premise in the town to which water and sewerage is available should be connected with the sewer. All privies on premises connected with the sewer should be immediately abandoned and removed. All privies on premises to which sewerage is not available should be screened against flies and provided with water-tight receptacles. Such privies should be frequently inspected and regularly cleaned under municipal supervision.

The very large sum already expended by the city in the extension of the sewer system is rendered largely unavailing as long as so many premises are not connected with the sewer. The privies are found in all parts of the town, the best as well as the worst. No neighborhood is free from them. The investment made by the city and by the citizens for sewer connections is nullified so long as privies are permitted to remain in their present condition.

The forcible connection of premises to which sewerage is available is required by State law. It should also be required by local ordinance and should be promptly and rigidly enforced.

The sanitation of those privies which must be permitted to remain until sewers can be extended to them is neither difficult nor an expensive matter. The provision of two metal receptacles, screened against flies, will accomplish the purpose at a cost of two to three dollars per family.

Along with the sanitation of these privies must come some system of regular cleaning. For this purpose the town should contract with a scavenger for the regular cleaning of all privies, the cost to be paid by the householder. This cleaning should be done at least twice a month, and the contents of the privies should be put into water-tight receptacles and removed from the town, and should be disposed of by shallow burial on some suitable disposal ground. The cost of such a system would not exceed 35 cents per month per family, no greater than the cost of cleaning twice a year, and would add much to the comfort and convenience of life on unsewered premises as well as diminishing greatly the dangers from the present state of affairs.

Garbage.—One of the most noticeable sights in the back alleys of the town are the piles of ashes, refuse, and half-consumed garbage. Most householders make some efforts to burn their garbage. Some bury it. To every citizen of the city this is a disagreeable and troublesome matter. It seems desirable in a city the size of Perry that some method be adopted by which the community instead of the individual attend to this matter.

Regular collection of garbage in the summer months is a sanitary necessity. For this purpose it would seem that the commercial value of the garbage as a food for hogs should render the solution of the difficulty easy and inexpensive. If the town can be divided into districts, and garbage collected daily, its disposal by feeding to hogs, if properly conducted, will be profitable and sanitary. Efforts should be made to organize and administer such a system. It is already in use in many towns and small cities, and in one large city at least, Denver, Colo. In a hog country like Iowa it would seem to offer a good solution of the difficulty.

Other sanitary needs.—When the town has satisfactorily solved the fundamental needs outlined above there are certain other important subjects which should receive attention.

The medical inspection of school children, to discover remediable defects in time for their prompt and successful correction, the inspection of dairies, with a view to the production of clean milk, the inspection of other food products, the more accurate control of contagious diseases, work against tuberculosis and infant mortality, are all important and should as soon as possible be taken up. For the present, however, it is suggested that attention be focused on the fundamentals until the conditions they now present are successfully disposed of.

Conclusion.—The people of Perry have displayed in their city much civic pride and enterprise. They have labored with earnestness and success to make their city prosperous and beautiful. Their schools, hospital, streets, library, and other civic enterprizes should be a source of pride and satisfaction to every citizen. They should give to the subject of making the city healthful at least as much thought, energy, and earnestness as they have to these other features of city life. It has been demonstrated too often to be a matter of conjecture that civic health is as much a purchasable commodity as good streets or bright lights. Perry should be a model town, healthy as well as beautiful. To permit the present sanitary conditions to exist alongside the striking civic achievements of the city is unthinkable.

Respectfully,

A. W. Freeman, M. D.,
Epidemiologist, United States Public Health Service.

(Submitted to town council Oct. 11, 1915.)

(Adel.)

As a part of the sanitary survey of Dallas County, undertaken by the United States Public Health Service in cooperation with the State Board of Health of Iowa, a sanitary survey of Adel was made, and the results are herewith briefly summarized for the information of the citizens and municipal authorities of Adel. In general it may be said that the results of this survey correspond accurately with the results of the survey made by officers of the Iowa State Board of Health in connection with the typhoid outbreak of December, 1914, and reported to the municipal authorities under date of July 9, 1915.

Fundamental factors.—While it is true that many factors within the control of the inhabitants influence the health of any community, it is also true that under all circumstances there are certain primary and fundamental factors in sanitation which outweigh all others and which should receive first consideration. These are the supply of water used for drinking and domestic purposes and the methods of disposing of the excreta, or waste products, from the bodies of human beings. It is to these two factors of sanitation in Adel to which attention is particularly invited in this report.

Water supply.—Adel possesses a public water supply which is adequate in quantity and of excellent sanitary quality. If it were in use by all citizens the question of water supply would be satisfactorily settled for many years to come. Unfortunately the public water supply is used at only about one-fourth of the homes of the city, and there are to be found at the present time about 300 wells in use within the town. These wells are located at an average distance of 87.2 feet from the privy on the same lot, and are of an average depth of 27.6 feet. Of the 298 wells within the town 211, or considerably more than two-thirds, are not properly protected against the entrance of filth about the top, and practically all, with the exception of 6 deep wells, are exposed to the danger of pollution by seepage from the soil, which, as will be seen from a later section of this report, is heavily loaded with filth from the numerous surface and pit privies in the town.

In a community so closely built up as is Adel no shallow well can be considered free from the danger of underground seepage from some of the numerous privies with which each is surrounded. That this pollution is a fact at the present time is clearly indicated by the results of the analysis of the water of every well in Adel which was made by the Iowa State Board of Health at the time of the survey referred to above. The conclusions of this report were to the effect that of the 272 wells from which samples were analyzed only 51 could be considered as above suspicion and a large number were grossly polluted. This report, which is on file with the city authorities, contains much valuable information on this and other points connected with the sanitary conditions of Adel.

From the standpoint of water supply, therefore, it must be concluded that conditions in Adel are far from satisfactory. With a safe water available at reasonable rates, most citizens still prefer to use the water from shallow wells, most of which have already been shown by analysis to be polluted.

Disposal of human excreta.—From the standpoint of disease prevention the disposal of human excreta is as important as the question of water supply. The two are fundamental.

The human excreta or waste products from the human body are the only source of the infection of certain diseases. Properly disposed of they can do no harm; disposed of by careless or improper methods they give rise to typhoid fever, diarrhea, and dysenteries, have a large effect on infant mortality, and affect markedly the general health of the community. By proper disposal is meant such a method as will provide for the reception, storage, and removal from the community of all such material in manner that will not permit any of it to be scattered about so that it may get into water or be carried to foods by flies or other like agencies in any manner whatsoever.

The most cleanly, convenient, and sanitary method of disposing of human excretions is, of course, by the use of a water-closet and a sanitary sewer. Where this can not be used the same result may be attained by such a construction of the outdoor closets or privies that the matter deposited in them is received in a water-tight receptacle which is protected against flies and domesticated animals, and from which it is regularly removed in a sanitary and cleanly manner and carried beyond the limits of the town, there to be properly disposed of.

Adel possesses a sewer system which serves a large part of the town, and which might serve a much larger part by relatively small extensions. Unfortunately, however, only about one-fifth of the houses of the town are connected with the sewer, the remainder depending upon outdoor closets for disposal.

These closets can not be classed as sanitary. Of the 332 privies in the town only 1 is approximately sanitary in that it is supplied with a water-tight receptacle and rigidly screened against flies. Thirteen comply with one of the two conditions, being either provided with a water-tight receptacle or screened against flies. Two hundred and fifty-five are provided with pits which allow the material to go directly into the soil and are not screened against flies. Fifty-five, the largest percentage of any town in the county, are not screened against flies, permit the material to go directly into or onto the soil, and also are so constructed that chickens and other domesticated animals have free access to their contents.

A survey of the privies of the town, therefore, reveals the fact that practically all allow their contents to be carried into the soil with the rains, and practically all allow the access of flies to their contents. Fifty-five are in such condition as to be positive and dangerous nuisances.

Under such conditions, it is not surprising that typhoid fever has been a constant visitor to the town with each recurring summer. Leaving out of account the disastrous outbreak of November, 1914, there has been in Adel a small but definite amount of typhoid, due directly to the causes above enumerated, and which can be readily prevented by an improvement in existing sanitary conditions. Typhoid fever is but an example; other diseases are caused in the same way, particularly the mortality of infants. So long as the present conditions are permitted to remain, the town can expect to pay in sickness and death for them. Just as soon as present conditions are remedied the town can expect a marked and wholesome change in health conditions.

Recommendations.—The changes which are necessary and desirable in the sanitary conditions of Adel are obvious. Under the authority of the State law all premises which are located on existing sewer lines and not now connected should be at once connected with the sewer, and all privies on these premises and other premises connected with the sewer should be at once abandoned and removed.

Existing sewer lines should be extended as rapidly as possible, until a sewer line is accessible to every lot in the city.

Existing privies should be required to be provided with a water-tight receptacle, properly screened against flies and animals, and all such privies should be cleaned at regular intervals by a scavenger appointed for the purpose by the town authorities.

The water system of the town should be extended to reach every lot, and when available, connection should be made with the city water and all private wells abandoned and filled up.

Conclusion.—The conditions described in this report are the concern only of the citizens of the town. This report is intended not as in any sense a criticism of the town, but as a plain statement of the facts as they were found. The remedies suggested are perfectly obvious. The advantages to be derived from putting these remedies into effect should be equally obvious.

To effect any improvement in conditions it is necessary that the citizens recognize the harmful influence of present conditions upon the health and upon the good name of the community, and that they set about improving them with seriousness and determination. It is easily within the reach of the town to become a model of sanitation and healthfulness. Health in a town the size of Adel is a purchasable commodity. Surely no other expenditure possible to the town should appeal so strongly to the citizenry.

Respectfully,

K. E. Miller,
Assistant Surgeon in Charge.

(Submittel to town council Oct. 13, 1915.)

(Redfield.)

The sanitary survey of Redfield undertaken by the United States Public Health Service in cooperation with the Iowa State Board of Health has been completed, and the results are herewith presented for the information of the town council and the citizens of Redfield. During the course of the survey every home in Redfield was visited and accurate information was collected as to the fundamental factors in sanitation. Much other information bearing on the health of the citizens was collected and recorded, but the prime object of the survey was to determine just where the town stands in the fundamentals of sanitation.

Water supply.—The survey comprised a visit of inspection to 218 premises. There were on these premises 112 private sources of water supply. Seventy-three premises were supplied with water from the town supply and 33 had no source of supply. The private sources of supply were classified as to their character and as to their protection against the entrance of filth about the top as follows:

Kind of supply.	Total number.	Number properly protected.	Number not properly protected.
Dug wells	82	42	40
Bored wells	12	5	7
Drilled wells	1	1	....
Driven wells	3	1	2
Cisterns	12	8	4
Wells not classified	2	1	1
Total	112	58	54

It will be seen from the above table that of the 112 private sources of water in the town, 54, or 48 per cent, are in such condition as to be classed as potentially dangerous by the inspector. It should be borne in mind that this refers only to the dangers of filth entering the well through the top, and does not take into account the danger of pollution by seepage through the soil, which, as will be set forth in a later section of this report, is heavily polluted with filth. The average distance between the well and the privy in Redfield is 54 feet. There are 46 wells located within 50 feet or less of the privy.

Waste disposal.—Of the factors influencing health in a community such as Redfield, the most important is the method of disposing of human waste. Redfield is without a public sewer system, and has therefore to depend upon the efforts of the individual citizen to solve this most important of all sanitary questions. Of the 218 premises, 12 were provided with water-closets, 1 of which was connected with a septic tank and 11 with cesspools. The remaining premises were provided outdoor closets or no closets at all, as shown in the following table:

Premises with strictly sanitary outdoor closets	0
Premises with nearly sanitary outdoor closets	2
Premises with closets polluting soil and underground water, but screened against flies	12
Premises polluting soil and underground water and not screened against flies	164
Premises with grossly insanitary closets, polluting soil and underground water and accessible to flies and animals	19
Premises without closets	5
Total	202
Water-closets	12
Not classified	4
Total premises	218

It will be seen from this report that the method of disposing of human filth in this community, though on the average better than in most communities of the same size in the United States, is far from satisfactory. When we realize that human filth is the only source of the infection of many common diseases, and that its dissemination in any community produces definite diseases, such as typhoid fever, diarrhea, and dysentery, and in addition affects more largely than any other factor the mortality of infants, and further affects the general health of the community in ways not yet understood, we understand that the proper disposal of human filth is the most important single sanitary problem. By proper disposal is meant such a method as will prevent any of the filth from being scattered about, so that it may reach the food, water, or anything else by which it may enter human mouths.

Closets of the type at present found in Redfield do not meet this condition. One hundred and ninety-five of them are of such construction that flies have ready access to their contents. This indicates that a large majority of the flies which enter the homes of the town have recently visited human filth, and that most of them are constantly soiled with it. If we are to protect ourselves from the fly-borne diseases, we must prevent the access of flies to human filth.

In addition to the danger of filth carried by flies, there is in Redfield at this time another danger even greater—that of filth seeping into the wells from a soil polluted beyond its capacity for purification. While it is true that water is usually freed from filth by its passage through the soil, there is a limit to the amount of filth which may be removed in this way, and when that limit is reached, filth may pass through the soil and reach the underground sources of drinking water. It would seem that this condition of overloading of the soil exists in Redfield. There are at present 183 closets whose contents go immediately onto or into the soil. In addition, the accumulations of filth of many years still remain in the soil of certain premises, since many closets are not cleaned, a new pit being dug when necessary and the contents of the old pit covered with earth without removal. In this way the soil has been polluted for many years and the amount of the pollution is constantly increasing. The cesspools (11) also increase greatly the dangers of serious pollution of underground waters.

Conclusions and recommendations.—The most satisfactory solution of the difficulties encountered in Redfield at this time would be the installation of a sewer system reaching the entire town, with a total abolition of the outdoor dry closet. It would seem from the financial condition of the town, however, that this is out of the question, and other means for meeting the situation must be sought.

In connection with the question of water supply it is highly important that the town water supply be furnished to as many homes as possible. The town water is ample in amount and apparently of good quality. Its use would permit the closing of practically all private wells in the town and a removal of the danger to health which they constitute.

For the purpose of preventing the dangers of the present types of privy it is highly desirable that the privies of the town be reconstructed and provided with water-tight metal receptacles of convenient size, properly screened against flies, and that there be established a public scavenger system for the regular cleaning of these privies. By this method the excreta will be prevented from polluting the soil, will be protected against spread by flies or other similar means, and will be promptly and regularly removed from the town to be disposed of by burial. For this purpose it is recommended that the council pass an ordinance requiring all privies to be provided with water-tight receptacles of convenient size, properly protected against flies, and arrange at once for a public scavenger to clean all privies at least twice each month.

The cost of installing and operating such a system is not excessive. The average privy can be reconstructed to meet the conditions of the ordinance proposed at a cost of about $2.50, and the cost of the scavenger system will be about 30 or 35 cents per month per family. As the cost of cleaning the present type of privy once a year amounts to from $5 to $7 a year, it will be seen that the new method is not more expensive and may even be cheaper. It seeks to substitute the community action for that of the individual. It gives a type of privy which is regularly cleaned, and can easily be kept in sanitary condition. This plan is in practical operation in many towns at the present time and gives entire satisfaction.

It is recommended also that steps be taken to put the large number of leaky well tops and faulty well curbs in sanitary condition. For this purpose a cement platform is recommended.

In conclusion, it should be said that this report is not intended as a criticism of Redfield. Similar reports have been made and will soon be made to all the towns in Dallas County. The purpose of the work is to point out feasible methods by which sanitary conditions in Dallas County may be made as nearly perfect as possible, thereby not only improving the health of the people but adding to the reputation of the county as a desirable and healthful place to live.

Respectfully,

K. E Miller,
Assistant Surgeon in Charge.

(Submitted to town council September 21, 1915).

(Woodward).

In the course of the sanitary survey of Woodward, undertaken by the United States Public Health Service in cooperation with the Iowa State Board of Health, every home in the town was visited and accurate information was collected as to the two fundamental factors in sanitation—the water supply and the method of disposing of wastes. Much other information bearing on the health of the people of Woodward was collected by the inspectors and recorded, but the primary object of the survey was to determine just where the town stands in the primary essentials of sanitation. The results of the survey, with the comments of the Government health officers and their recommendations for improvement are summarized below:

Water supply.—The sanitary survey of Woodward comprised a visit to 275 premises. There were on these premises 213 sources of water supply. One hundred and ninety-one of these were wells, the remainder, 22, using the town supply. The wells were classified as to whether they were dug, bored, or drilled, and as to their proper protection against the entrance of filth about the top, as follows:

Kind of well.	Number properly protected.	Number not properly protected.	Total.
Dug	17	27	44
Bored	81	64	145
Drilled	2	0	2
All wells	100	91	191

It will be seen from the above table, that notwithstanding the fact that Woodward had a public supply of water, it is used by only 22 families, and that there are, within the limits of the town, 191 private sources of supply, of which 91 or nearly half are in such condition as to be classified as dangerous by the inspector. It should be borne in mind that this refers only to the dangers of filth entering through the top of the well, and does not take into account the danger of pollution by seepage from the soil which, as will be seen from a later section of this report, is highly polluted with human filth.

Waste disposal.—Of the factors influencing health in a community such as Woodward, the most important is the method of disposing of human waste. Woodward is without a public sewer system and has therefore to depend upon the efforts of the individual citizen to solve this most important of all sanitary questions. Of the 275 premises inspected, 16 were found to be provided with water-closets of which 11 were connected with septic tanks and 5 with cesspools. The remaining premises were furnished, either with outdoor dry closets or with no closet at all, as shown in the following table:

Premises with sanitary outdoor closets	0
Premises with nearly sanitary outdoor closets	1
Premises with closets polluting the soil and underground water, but screened against flies	46
Premises with closets polluting the soil and not rightly screened against flies	189
Premises with open-back, insanitary closets, grossly dangerous to public health	5
Premises without closets of any kind	19

It will be seen from this table that the methods of disposing of human filth in this community, though on the average better than in most communities of the same size, is far from satisfactory from the standpoint of sanitation. When we realize that human filth is the greatest source of the infection of many common diseases, and that its dissemination in any community produces definite diseases such as typhoid fever, diarrhea and dysentary, and in addition affects perhaps more largely than any other factor mortality of infants, and further affects the health of the population in ways not yet understood, we realize that proper disposal of human filth is the most important single sanitary problem. By proper disposal is meant the use of such a type of closet as will prevent any of the filth from being scattered about so that it may reach the mouths of human beings by any means whatsoever.

Toilets of the type found in Woodward do not meet this condition. Two hundred and thirty-six of the toilets are of such construction that flies have access to their contents. This means that a large majority of the flies which enter the homes of Woodward have recently visited human filth, and that most of them are constantly soiled with it. No housewife, however active, can keep all flies from the house. If we are to be protected against fly-borne diseases we must protect human filth from flies.

In addition to the danger of filth carried by flies, there is under present conditions in Woodward a danger equally as great, that of filth seeping into the wells through a soil polluted beyond its limit of purification. While it is true that water is usually free from filth by its passage through the soil, there is a limit to the amount of filth which can be taken care of by the soil, and when that limit is reached, filth will pass through the soil and pollute wells, however perfectly their tops may be protected. This condition exists in Woodward. There are at the present time 239 closets whose contents go immediately on or into the soil. In addition, the accumulation of years of filth still remains in certain soils, since a majority of closets are not cleaned, a new pit being dug when necessary and the contents of the old pit covered with the earth removed. In this way the soil has been polluted for many years, and the pollution is constantly increasing. There is no doubt whatever that practically every well in Woodward is at the present time polluted with filth.

Other factors.—There are many factors affecting the health of the people of Woodward which might be studied with profit. The inspection of milk and food, the medical inspection of school children, more rigid control of contagious diseases, the general cleanliness of the town, as well as of restaurants, hotels, and other places used for the manufacture or sale of food, are all important and should sooner or later receive attention at the hands of the citizens.

The matter of waste supply and refuse disposal, however, are so much more fundamental and important and affect so much more vitally the health of the people, that they should be given first consideration.

Recommendations.—The most satisfactory permanent remedy for the conditions found in Woodward at the present time would be the installation of an adequate and safe supply of water, with which all citizens should be compelled to connect their premises, and the abandonment and filling up of all wells within the town limits. This is in line with common sense and good business, and is in the long run the most economical and satisfactory as well as sanitary solution of the water-supply problem.

In the matter of refuse disposal, likewise, the best permanent solution consistent with the character and means of the town, would be the installation of a complete sewer system, reaching all premises, and with the abandonment and removal of all outdoor dry closets within the limit of the town. Running water, available for domestic use, hot water for bathing, and water carriage sewerage are, from the standpoint of convenience alone, worth their cost. From the standpoint of health they are essential. The dry closet has no place in a community of the character of Woodward.

Temporary remedies.—The installation of a proper system of sewerage and water must of necessity require considerable time. If this work were begun at once, however, present insanitary conditions should not be allowed to remain. Steps should be taken at once to put a stop to further pollution of the soil and to protect as far as possible existing water supplies.

Soil pollution as well as the carriage of human filth by flies and other means can be prevented at a reasonable cost by the reconstruction of all existing toilets to conform to sanitary requirements. This requires that each be provided with water-tight repositories for the filth. These should be galvanized cans of about 1 bushel capacity, which should be placed under the seats and so arranged that flies are excluded. The reconstruction of the average privy in this manner can be done at a cost of about $2.50.

The reconstruction of the privies will necessitate some regular and systematic method of cleaning and removal of contents. For this purpose the town should institute a scavenger service, with provision for cleaning every closet twice each month. Such a service can be instituted at a cost of about $700 per annum. This may be paid out of the town treasury or assessed against the property owners at so much (say, 30 cents) per month.

The cost of this system, as compared with the existing means, is ridiculously small. It will give the town almost perfect immunity from typhoid fever and dysentery, will reduce infant mortality, and prevent much other sickness. It will in addition take from the individual the burden of looking after his own closet, keep all closets in a clean and sanitary condition, and add greatly to the self-respect of the town.

Water supply.—The most important step for the protection of existing water supplies has been outlined above; that is, the prevention of further pollution of the soil. In addition, however, all well tops should be made water-tight and protected against the entrance of filth from about the top. This must be done by the individual citizen.

Conclusion.—In conclusion it should be said that this report is not intended as a criticism of Woodward. Woodward is not worse, and in many respects better, than the average town of its size in the United States. What has been said of local conditions refers not to their comparison with other towns, but with clean conditions. Similar things will probably be said of the other towns in this county. Woodward has the opportunity to be the first town to become sanitary and to score highest when all the towns are scored at the end of the fall. The improvement of present conditions depends upon the citizens of the town. The work of the health officers does not comprehend the compulsion of any community. It can not be believed, however, that the citizens of Woodward do not desire that the town be made as healthy as it is possible to make it. If they desire that the town be put in sanitary condition, the way is plain and every possible assistance will be afforded.

Respectfully,

K. E. Miller,
Assistant Surgeon in Charge.

(Submitted to town council Aug. 20, 1915.)

(Dallas Center.)

The sanitary survey of Dallas Center, undertaken by the United States Public Health Service in cooperation with the Iowa State Board of Health, has been completed, and the results are herewith presented for the information of the town council of Dallas Center. During the course of the survey every home in Dallas Center was visited, and accurate information was collected as to the two fundamental factors in sanitation—the water supply and the method of disposing of wastes. Much other information, bearing on the health of the people was collected and recorded, but the prime object of the survey was to determine just where the town stands in these fundamentals of sanitation.

Water supply.—The survey comprised a visit of inspection to 258 premises. There were on these premises 205 sources of water supply. Fifty-three premises had no individual source of supply, depending on public wells or the sources of neighbors. These sources of supply were classified according to their character and as to their protection against the entrance of filth about the top, as follows:

Kind of supply.	Total number.	Number properly protected.	Number not properly protected.
Dug wells	65	28	37
Bored wells	107	70	37
Drilled wells	3	3	0
Wells not classified	3	3	0
Cisterns	27	23	4
Total	205	127	78

It will be seen from the above table that of the 205 sources of water in the town, 78, or 38 per cent, are in such condition as to be classed as potentially dangerous by the inspector. It should be borne in mind that this refers only to the dangers of filth entering through the top of the well and does not take into account the danger of pollution by seepage through the soil, which, as will be seen from a later section of this report, is heavily polluted with filth.

Waste disposal.—Of the factors influencing health in a community such as Dallas Center, the most important is the method of disposing of human waste. Dallas Center is without a public-sewer system and has therefore to depend upon the efforts of the individual citizen to solve this most important of all sanitary questions. Of the 258 premises inspected, 7 were provided with water-closets, 2 of which are connected with septic tanks anl 5 with cesspools. The remaining premises were furnishel either with outdoor dry closets or with no closet at all, as shown in the accompanying table:

Premises with sanitary outdoor closets	0
Premises with nearly sanitary outdoor closets	5
Premises with closets polluting the soil and underground water, but screened against flies	48
Premises with closets polluting soil and underground water and not screened against flies	185
Premises with open back, grossly insanitary closets	6
Premises without closets of any kind	7

It will be seen from this report that the method of disposing of human filth in this community, though on the average better than in most communities of the same size in the United States, is far from satisfactory from the standpoint of sanitation. When we realize that human filth is the only source of the infection of many common diseases, and that its dissemination in the community produces definite diseases, such as typhoid fever, diarrhea, and dysentaries, and in addition affects more largely than any other factor the mortality of infants, and further affects the general health of the population in ways not yet understood; we realize that the disposal of human filth is the most important single sanitary problem. By proper disposal is meant such a method as will prevent any of the filth from being scattered about so that it may reach water, food, or human mouths until it has been removed from the community or utterly destroyed and disinfected.

Toilets of the type at present found in Dallas Center do not meet this condition. One hundred and nine of them are of such construction that flies have access to their contents. This indicates that a large majority of the flies which enter the homes of the town have recently visited human filth, and that most of them are constantly soiled with it. If we are to protect ourselves against fly-borne diseases, we must prevent the access of flies to filth.

In addition to the danger of filth carried by flies, there is under present conditions in Dallas Center another danger equally as great; that of filth seeping into the wells from a soil polluted beyond its limit of purification. While it is true that water is usually freed from filth by passage through the soil, there is a limit to the amount of filth which may be taken care of by the soil, and when that limit is passed filth will pass through the soil and pollute wells, however perfectly their tops may be protected. This condition of overloading the soil with filth exists in Dallas Center. There are at present 239 closets whose contents go more or less immediately on or into the soil. In addition, the accumulation of the filth of years still remains in certain soils, since many closets are not cleaned, a new pit being dug when necessary, and the contents of the old pit being buried without removal. In this way the soil has been polluted for many years, and the pollution is constantly increasing. There is no doubt whatever that a majority of the wells of the town will show on analysis the evidence of pollution.

Other factors.—There are many factors influencing the health of the people of Dallas Center which might be studied with profit. The inspection of milk and food, the medical inspection of school children, the more rigid control of contagious diseases, the general cleanliness of the town, as well as the inspection of restaurants, hotels, and other places where foods are manufactured or sold, are all important and should in time receive attention, but the matters of water supply and waste disposal are so much more fundamental and important and affect so much more vitally the health of the citizens, that until these are properly solved the minor matters can well afford to go over.

Recommendations.—The only permanent and satisfactory remedy for the conditions existing at the present time is the installation of an adequate and safe water supply, to which all citizens should be required to connect. All shallow wells should be abandoned and filled up. Along with the water supply should be installed an adequate and complete sewer system, reaching every lot in the town, to which every house should be connected. All outdoor privies should then be abandoned and removed. These recommendations are in line with common sense and the united experiences of cities and towns everywhere. Nothing else is compatible with the economic and social conditions of the town. Such a system should be considered necessary from the standpoint of convenience and cleanliness alone. From the standpoint of health it is indispensable.

Temporary remedies: The installation of a proper system of water and sewerage must of necessity require months or even a year or more. If this work were begun at once, however, present insanitary conditions should not be allowed to remain. Steps should be taken at once to put an end to further pollution of the soil, and to protect against the carriage of filth by flies and similar means.

Soil pollution and the carriage of filth by flies and similar means can be prevented at a reasonable cost by the reconstruction of all toilets to conform to sanitary requirements. This necessitates that each toilet be provided with a water-tight receptacle for the filth, and this receptacle screened against flies and domesticated animals. These receptacles should be of metal and of about 1 bushel capacity. They should be placed under the holes in the seats, and so arranged as to be easily accessible for cleaning, and at the same time protected against flies. The reconstruction of the average privy in this manner can be accomplished at a cost of about $2.50.

Such privies, however, must have regular cleaning and removal of contents. For this purpose the town should institute a scavenger service, with provision for cleaning every closet at least twice each month. Such a service can be instituted at a cost of about $700 per annum. This may be paid out of the town treasury, or assessed against the property owner at so much, say 30 cents per month.

The cost of such a system as compared with the cost of the present insanitary and unsatisfactory system is not very much greater, if at all. It will give the town almost perfect immunity from typhoid fever and dysentery, will reduce the sickness and mortality of infants, and prevent much general ill-defined sickness. In addition it will take the burden of cleaning and care from the individual, and keep all closets at all times in clean and sanitary condition.

Water supply: The most important steps for the protection of the water supply have been outlined above, preventing further pollution of soil. In addition, however, all well tops should be repaired in such a manner as to prevent the entrance of surface water or filth about the top.

Conclusion.—In conclusion it should be said that this report is not intended as a criticism of Dallas Center. It is no worse, and in some respects better than other towns of its size. What has been said in reference to conditions, has in mind comparing present conditions, not with conditions in other towns, but with what the town could and should have. Similar reports are being made or have been made to other towns in the county. It is hoped that when the reinspection is made at the end of the work, Dallas Center will be in such condition as to be a strong contender for the honor of being the cleanest town in Dallas County.

Respectfully,

K. E. Miller,
Assistant Surgeon in Charge.

(Submitted to town council September 3, 1915.)

(Dexter.)

The sanitary survey of Dexter, undertaken by the United States Public Health Service in cooperation with the Iowa State Board of Health, has been completed and the results are herewith presented for the information of the town council and the citizens of Dexter. During the course of the survey every home in Dexter was visited, 257 in all, and accurate information was collected as to the two fundamental factors in sanitation—the water supply and the methods of disposing of human excreta. Much other information bearing on the health of the citizens of Dexter was collected and recorded, but the prime object of the survey was to determine just where the town stands in these two essentials of sanitation.

Water supply.—Dexter is without a public water supply, and there are on the 257 premises 218 private sources of supply, including 216 wells and 2 cisterns. These sources of supply are classified according to their character and to whether or not they are properly protected against the possibility of the entrance of filth about their tops as follows:

Kind of supply.	Total number.	Number properly protected.	Number not properly protected.
Dug wells	105	55	50
Bored wells	90	63	27
Drilled wells	3	0	3
Driven wells	1	1	0
Wells not classified	17	7	10
Cisterns	2	2	0
Total	218	128	90

In addition to the sources of supply tabulated above, 17 families use water from the town pump and 37 premises, mostly stores, are without any water supply.

It will be seen from the above table that nearly half the dug wells and almost one-third of the bored wells are in such condition that filth may enter them through the top. Such wells are dangerous to persons using water from them and should be placed in proper order without delay.

In addition to the dangers of pollution through the top, every well in a thickly settled community like Dexter is in constant danger of pollution by seepage from the soil overloaded with filth from the numerous privies located near them. The average distance between the privy and the well on the same lot in Dexter is 67 feet, and the average depth of the wells in Dexter is only 27.7 feet. There are 75 wells in Dexter located within 50 feet of a privy.

That this danger of pollution by seepage is very real at this time is shown by the results of water samples collected from 9 wells in the town and analyzed at the laboratory of the State board of health in Perry. These wells were selected by reason of the fact that their tops were sound and tight, to determine whether or not underground pollution is taking place at the present time. Of the 11 samples examined, 7, including the sample of water from the town well, showed the presence of the colon bacillus, indicating active pollution at the present time. The results are given below:

Number of sample.	Date of collection.	Result.	Remarks.
1883	Oct. 8	Negative	
1912	do	do	
1777	do	do	
Town well	do	B. coli	Polluted.
1921	do	do	Do.
1860	do	do	Do.
1875	do	do	Do.
1917	do	do	Do.
1797	do	do	Do.
1858	do	do	Do.
School well	do	Negative	

NOTE.—The results of these analyses will be mailed direct to the householders from whose wells the samples were taken.

It will be seen from the above table that the situation of Dexter as regards its water supply can not be considered as satisfactory.

Excreta disposal.—Of the factors influencing health in a community such as Dexter, the most important is the method of disposing of human waste. Human excreta are the only source of the infection of certain diseases of which typhoid is an example, and the improper disposal of human filth, allowing it to be disseminated in the community and to reach the water supplies and foods. results, not only in the prevalence of typhoid fever, diarrhea and dysenteries, but in an increase in the sickness and mortality of infants, and in a general lowering of the health tone of the community. Proper disposal of human excreta, on the contrary, results in the practical obliteration of typhoid fever, diarrhea, and dysentery, in a marked reduction in the sickness and mortality of infants and in a marked and general improvement in the general health of any community in which it is practiced. By proper disposal is meant such a method as will receive and hold the matter so that it can not be spread about by any means whatsoever, either by seeping into the ground and reaching water supplies, or by being spread about by flies or domestic animals. This requires that every closet be provided with a water-tight receptacle for the excrement, that this excrement be protected against the access of flies, and that the contents of the receptacle be regularly removed in a clean and sanitary manner and be carried beyond the limits of the town, there to be properly disposed of.

Present conditions in Dexter do not meet these conditions. There are within the limits of the town 230 privies. These are classified as follows:

Privies with water-tight receptacles, screened against flies	2
Privies with either water-tight receptacles or screening against flies	24
Pit privies, polluting the soil and not screened	191
Open-back, insanitary privies, public nuisances	13
Total privies	230
Water-closets with septic tanks	3
Water-closets with cesspools	9

It will be seen from the above table that there are more than 200 privies in the town whose contents go directly onto or into the soil, and contribute to the pollution of the soil, which, as has been shown already, affects a majority of the wells in town. It will be seen also that more than 200 privies are so constructed that their contents are exposed to flies. This means that during the fly season practically all flies have convenient access to human filth, and that a majority of them are probably soiled with it at all times, carrying it on their feet into the homes, kitchens, and dining rooms of the town.

Conclusions and recommendations.—The conclusion to be drawn from a study of present sanitary conditions in Dexter is that the people of the town have never given the matter of sanitation the same effort and consideration they have displayed in their other civic affairs. The conditions found are in general similar to those of the other towns in the county, and the remedies necessary to correct the conditions are the same.

It is recommended that all privies in Dexter be reconstructed into sanitary privies, by providing each with a water-tight receptacle under each seat, so arranged that flies and other animals are excluded. Along with this change in the system of privies there should be provided a regular scavenger system under the supervision of the town authorities for the regular and systematic cleaning of these privies.

This system is already in use in many cities and towns in the United States and offers the only practicable solution of the privy problem. It is not unduly expensive, since the average privy in Dexter can be reconstructed to comply with the specifications at a cost not to exceed about $3 or $4, and since the cost per annum of cleaning the privies so constructed, with their convenient and easily removable receptacles, though done twice a month, is no greater than the cost of cleaning the present pits once or twice a year.

This system will at once do away with the question of soil pollution, since the water-tight receptacle absolutely prevents soil pollution, and will at the same time prevent all danger of fly transmission of filth, since flies are excluded from the privy contents. It takes off the individual citizen all the trouble of looking after the privy, and substitutes a system under the control of the city for individual effort. It offers the only immediate practical solution of the difficulty, and is at once simple, inexpensive, and practical.

To put this system in use it will be necessary for the council to pass an ordinance requiring the reconstruction of all privies within a given time, and to provide a scavenger system by contract or otherwise. It will require the cooperation of all citizens in enforcing the law, and starting the system. Once started, the system will without doubt prove so satisfactory as to insure its continuation under proper conditions.

The conditions as presented are the concern primarily of Dexter. The prevention of disease resulting from insanitary conditions such as those herein described, is within their reach. It is to be hoped that the town will at once determine to make Dexter the cleanest and most sanitary town in Dallas County or in the State of Iowa.

Respectfully,

K. E. MILLER,
Assistant Surgeon in Charge.

(Submitted to town council Oct. 13, 1915.)

(Minburn.)

The sanitary survey of Minburn, undertaken by the United States Public Health Service in cooperation with the Iowa State Board of Health, has been completed, and the results are herewith summarized for the information of the town council and the citizens of Minburn. During the course of the survey every home in Minburn was visited and information was collected as to the various factors influencing the health of the people. The prime object of the survey was to determine just where the town stood in the two fundamentals of sanitation, water supply and methods of disposing of wastes.

Water supply.—One hundred and twenty-eight homes were inspected within the limits of the town, and 101 private wells and one cistern were found. Ten families use water from the town pump and one from the school pump. The 101 private wells were classified according to their character and their protection against the entrance of filth about the top as follows:

Kind of well.	Total number.	Number properly protected.	Number not properly protected.
Dug wells	42	20	22
Bored wells	51	27	24
Not classified	8	5	3
Total	101	52	49

It will be seen from the above table that of the 101 sources of water in the town, 49, or nearly half, are in such condition as to be classed as potentially dangerous by the inspector. It should be borne in mind that this refers only to the dangers of filth entering through the top of the well, and does not take into consideration the danger of pollution by seepage through the soil, which as will be seen from a later section of this report, is heavily polluted with filth.

Waste disposal.—Of the factors influencing health in a community such as Minburn, the most important single one is the method of disposing of human waste. Minburn is without a public sewer system, and has therefore to depend on the efforts of the individual citizen to solve this most important sanitary question. In general, it may be said the methods practiced in Minburn are the same as those in use in the surrounding country districts, and do not take into account the necessity for added precaution which the closely built-up nature of the town demands. A method of waste disposal which might be fairly satisfactory at a country home where the water supply can be located several hundred feet from the well, and where only a few persons must be served, is entirely inadequate for a closely built-up town where the average distance between well and privy is, as in Minburn, only 80 feet, and where there are 16 wells located within less than 50 feet from the privy.

The 128 premises in Minburn are provided with outdoor toilets as follows:

Premises with toilets with cement vaults, approximately sanitary	39
Premises with toilets with earth or other pits, permitting pollution of soil and underground water, and with contents exposed to flies	57
Premises with open-back, grossly insanitary closets, polluting soil and underground water, exposed to flies and to domestic animals	14
Premises without toilets	16
	126
Premises with outdoor toilets not classified	1
Premises with cesspools, poluting soil	1
Total inspected	128

It will be seen from the above table that about 40 per cent of the property owners of the town have complied with the requirements of the town ordinance calling for cement vaults to be built under all privies, but in spite of this fact there remain in the town 71 privies, the contents of which go directly into or on the soil. Almost all the privies are so constructed that flies have easy access to their contents.

When we consider that human filth is the only source of the infection of many common diseases and that its dissemination in any community, either by pollution of drinking water or by flies and similar means, produces certain definite diseases such as typhoid fever and diarrhea and dysenteries, and that the proper disposal of human filth influences more largely than any other factor the mortality of infants and affects the general health of the population in ways that we do not now understand, it will be seen that the proper disposal of human filth is the most important single sanitary problem. By proper disposal is meant such disposal as will prevent any particle of human filth, however small, from reaching the mouth of any human being, whether by water, food, flies, or other means.

Most privies at present found in Minburn do not meet this condition. Those provided with cement vaults can readily be made to do so by attention to the small details of fly proofing. The remainder must be provided with water-tight receptacles in addition to fly proofing.

There are many other factors influencing the health of the people of Minburn which might be studied with profit. The two dwelt on above, however, so far overshadow all others in importance that until they are satisfactorily solved the others may well afford to go over.

Recommendations.—The only permanent and satisfactory remedy for the conditions existing in Minburn, in common with practically all towns of the same size, is the installation of a complete and adequate water supply, reaching all premises, and the complete sewering of the town, connecting with all premises. When such a system is secured every house should be connected with both water and sewer systems, and all wells filled up and privies removed. Such a condition is the best health insurance which any community can possess. From the standpoint of convenience and comfort it is well worth the cost; from the standpoint of health it is indispensable.

While the town is somewhat smaller than those for which such a system is usually recommended, the economic resources of the town are so large and the standard of living so high that it must not be considered impossible. The cost of a proper system for the town, compactly built as it is, would not be excessive, and the saving in insurance rates alone would pay a large part of the interest on the bonds.

Temporary remedies: The installation of a water and sewerage system is of necessity some distance in the future, and meanwhile present conditions should not be permitted to continue. The present ordinance, already complied with by nearly half the property owners, meets the problem of soil pollution. The addition of a feature requiring that all privies be screened against flies would give the town a satisfactory system. It is recommended, therefore, that the enforcement of the present ordinance be carried out without delay. Failure to carry it to completion renders useless the work already done, since there remain sufficient privies polluting the soil to render conditions dangerous, and at the same time work a hardship on the citizens who have obeyed the law.

The protection of wells against pollution about the top is usually a simple and inexpensive matter. It is certainly in line with common sense and reasonable notions of cleanliness. It should be done by every citizen for the protection of his own family, but if necessary, should be enforced by an ordinance.

Conclusion.—The enforcement of the present ordinance requiring cement vaults for all privies, with a slight addition requiring fly proofing, will settle in a manner which should be satisfactory to all, one of the vexing problems of life in Minburn.

In conclusion, the town should be congratulated on the passage of the existing ordinance, somewhat in advance of the other towns in the vicinity, and upon the work already done in its enforcement. It is to be hoped that the remaining property owners will comply with its provisions without delay, and that when the towns of the county are again inspected at the close of the work now being done by this Service and the State Board of Health, Minburn will be found to score among the highest in the county.

Respectfully,

K. E. Miller,
Assistant Surgeon in Charge.

(Submitted to town council September 10, 1915.)

Perry.—Perry, the largest town, with a population of about 4,700, is in many respects a thriving and prosperous town. At the time of the survey it had several miles of paved streets, a system of decorative street lighting, excellent schools and churches, and presented to casual observation an exceptionally cleanly and attractive appearance. The town is thickly built up, covering an area of about 2 square miles. It has a small number of factories and does a large retail business with the farmers of the county. The board of commerce was found to be a thriving and influential organization, meeting weekly during the winter months at luncheon for the discussion of civic and business problems.

From a sanitary standpoint the city presented a strong contrast of conditions. It possessed a public water supply, piped to practically the whole of the town, and had a complete and satisfactory system of sewers, reaching practically every part of the town and draining into a branch of the Raccoon River. In the central business part of the town every building was found to be connected with the sewer and to be using the city water for all purposes. In the residential districts of the better grade practically all houses were provided with indoor closets, but many were still connected with cesspools, and in a majority of cases an old privy was to be found, which in some instances was used little or not at all, but remained as a reminder of the days when sewers were unknown in the town. Many residences, too, had cisterns, used as a rule only for laundry purposes to avoid the hard water of the town supply. Many, even in the best residential districts, however, still had wells which were used for drinking in preference to the public water. In the outlying residential districts many homes were not connected with the sewers and depended for disposal of excreta on back-yard privies. Most of these privies were of the pit type, with leeching bottoms and were cleaned at irregular intervals by traveling scavengers. In these districts, also, shallow wells were commonly used as the source of water supply.

The public water supply was obtained from a series of deep bored wells. The use of this water was much restricted by reason of its hardness, and also, by reason of the fact that during the summer and autumn the water was highly colored and frequently had a very strong odor, due to the growth of algae in the standpipe. While always, apparently, of excellent sanitary quality, the water was thus unsuited for washing and laundry purposes, and was frequently physically unattractive, so that many citizens actually preferred the well water, which though potentially dangerous, was much softer than the deep well water, and was practically always clear, cool and free from odor.

The laws governing water supply and excreta disposal in the town were excellent. Compulsory connection with both water and sewerage when available were required, and all privies were required to be provided with watertight vaults and to be rigidly screened against flies.

The health officer was a physician, who received an exceedingly small salary for his services and who was expected to give a correspondingly small amount of time to the work. He was supposed to have charge of the control of communicable diseases, the enforcement of health ordinances, abatement of nuisances, milk and food inspection, and the manifold other features of health conservation in a city. He had no assistance and was a busy private practitioner of medicine. The ordinances regarding water and sewer connections had been on the books for several years, and there had been several sporadic efforts to enforce them. There had been, however, no sustained effort to enforce these or other health ordinances. As a result, sewer and water connections had been made at an exceedingly slow rate, and there was little or no public sentiment in favor of rigid enforcement.

Prior to beginning the survey of Perry, the cooperation of the board of commerce and the local newspapers was sought and obtained. A public meeting which was addressed by the State health officer was held. The survey was begun on October 1 and completed on October 8. On October 10 the tabulation was completed and the preliminary draft of the report and recommendations was presented to a full meeting of the board of commerce and unanimously indorsed. At the next meeting of the town council, on October 11, the report was presented, but owing to the fact that bids for the purchase of a new pump for the waterworks were being opened, there was no discussion of the report. At the next meeting of the council officers of the survey were present and were welcomed with great courtesy, but were informed that consideration of the report had been postponed until after November 1.

Adel.—Adel, the second largest incorporated place in the county, had a population in 1910 of 1,289 persons. It is the county seat and a thriving mercantile town, similar in its general character to other towns of somewhat smaller size in the county. It was found to possess a sewer system reaching about one-third of the town's area, and a water system accessible to about one-half of the dwellings. It had some paved streets and several sections built up with a good class of residences.

In November, 1914, the town suffered an outbreak of typhoid fever, occurring among those who had dined at the home of a prominent resident on November 5. Sixteen cases developed among those present at the dinner and two contact cases subsequently developed. The source of the infection was carefully investigated and was apparently definitely located as being in the cream or milk used at the dinner, which came from the country home of the family at whose home the dinner was held. According to the records of the rural survey there was a case of typhoid fever in a member of the family on the farm at the time the infection took place.

At the time of the outbreak the town was thoroughly surveyed by the authorities of the Iowa State Board of Health, and a complete report, including the analysis of water from every well in the town was presented to the council. Definite recommendations regarding the improvement of conditions were made by the State board of health at that time, but apparently no attention whatever was paid to the recommendations as no steps had been taken to remedy conditions. The main interest of the people of Adel had been, apparently, in debating whether or not the conclusions of the State board of health regarding the source of the epidemic were correct.

The survey of Adel revealed sanitary conditions on a par with those of Perry. There were found 298 wells, of an average depth of 27.6 feet, and an average distance from the nearest privy of 87.2 feet. Thirty-three wells were found to be less than 50 feet from the nearest privy.

Only about one-fifth (74) of the houses in the town were found to be connected with the sewer, there being 332 privies in the town limits, of which 255 were of the common soil-polluting type, and 55 of the extremely insanitary open-in-back type.

The town has suffered from typhoid fever more or less continuously since its establishment. The figures for the years since 1910 were as follows:

	Cases.
1911	2
1912	2
1913	3
1914 (epidemic)	18
1915 (contracted elsewhere)	2

In view of the fact that recommendations from the Iowa State Board of Health had been made to the town authorities during the course of the survey (July 19, 1915), it was not deemed advisable to do more than indorse these recommendations and to recommend that they be carried out. Up to the time of the completion of the survey (Nov. 1), nothing was done in the way of sanitary improvements in this town.

Redfield.—The town of Redfield is located in the southwestern portion of the county, on one branch of the Raccoon River. It was found to possess a public water system, derived from a deep well, and installed after a disastrous fire several years previously, for purposes of fire protection. This supply was in use by 73 families, and there were 112 private sources of supply in the town. Of the latter, 58 were regarded as properly protected and 54 as not properly protected at the time of the inspection. The average distance of these wells from the nearest privy was 64 feet, and there were 46 wells within 50 feet of the nearest privy. The average depth was 28 feet.

Within the limits of the town there were 13 premises with water closets, 11 of which were connected with leaching cesspools and one with a septic tank. There were 197 privies, of which 14 were approximately sanitary, 164 were of the common pit type and 19 of the extremely insanitary open-in-back surface type.

Following a public meeting held in the town, much interest in improved sanitation was manifested and a considerable number of citizens attended the special meeting of the council held on September 21, at which the report and recommendations were presented. The council manifested a disposition to pass an ordinance providing for a bond issue for sewers, but on investigation it was found that the limit for bonds provided by the town charter was so low as to make this procedure out of the question. The officers of the survey were then requested to prepare an ordinance covering the needed improvements of privies. A draft of an ordinance was prepared immediately and published with the report in the ensuing issue of the local paper. The meeting of the council to consider the ordinance was not held before the termination of the survey.

Woodward.—Woodward is located in the extreme northeastern corner of the county, on the county line. It covers an area of 1 square mile and had in 1910 a population of 712. It lies on an almost level prairie, gently sloping away from the town on three sides. It is thickly built up with an excellent class of residences and has a highly creditable business street in the center of the town. It has a grain elevator and a lumber yard in addition to the usual retail stores. It is located on the Omaha line of the Chicago, Milwaukee & St. Paul Railway, and is connected with Des Moines by a branch of the Interurban electric line. It is populated largely by persons owning farms in the neighborhood and by retired farmers.

Sanitary conditions in Woodward were found to be typical of those of all the towns in the county. The town possessed a public water supply, put in for fire protection, but it was in use by only 22 of the 275 families in the town. This supply was of fair quality, coming from a dug well in the edge of the town, but would not be adequate in amount for any large number of users. The distributing system was fairly complete, however, and would be a valuable asset should the town decide to attempt the installation of a general domestic supply.

The population in general depended on the shallow wells, located in the back yards of the small lots. These wells were found to be located always in the neighborhood of numerous privies and frequently within 40 or 50 feet. They were shallow, averaging about 40 feet in depth. About one-half were not properly protected against the entrance of filth about the top.

There was no public sewerage system in the town. Sixteen houses were provided with water-closets, of which 5 were connected with cesspools and 11 with septic tanks provided with underground drainage. The remainder of the population depended for excreta disposal on the ordinary outdoor closet. These closets were for the most part of the pit type, consisting of a privy house set over a deep pit. Practically none were screened against flies, though most of them were fairly well inclosed. There were only three of the extremely insanitary privies, open in back, found.

Some of the privies were cleaned at irregular intervals by traveling scavengers who came through the town once or twice a year. The material was removed to some near-by farm and deposited on the surface of the ground. Many privies were never cleaned, the material being covered with earth in situ, a new pit being dug for the privy.

The most striking feature of the sanitary situation in Woodward was the extreme degree of pollution of the soil from which the drinking-water supply of the town was taken. A tabular statement of the conditions of wells and privies in Woodward will be found in the report made to the town council.

The first public meeting held in the county was held on June 27 in the Methodist Church in Woodward. Great interest in improving sanitary conditions in the town was expressed by many citizens following the meeting. The survey of the town was begun on August 10 and completed four days later. On August 16 a summary of the results of the survey with recommendations was presented to the executive committee of the Commercial Club of the town, and on August 20 was presented to the town council in writing. The subject was debated freely by the town council, and a majority expressed themselves as in favor of an immediate passage of the ordinance which had been prepared in advance and was presented. Owing to the fact that the majority of the citizens had not had an opportunity to see the report, final action was deferred until a special meeting of the council to be held a week later. In the meantime the report had been printed in full, and on the Sunday night intervening between the two council meetings a second public meeting was held in the Methodist Church, which, owing to an almost unprecedented hard rain, was poorly attended. At a second meeting of the council, on September 5, the subject was debated at great length, all possible objections were presented and answered, but action was again postponed. A second special meeting was arranged for the week following, and in the meanwhile an appeal to the citizens to be present at the forthcoming meeting was printed in the local paper. At the third meeting of the council the subject was discussed again from all angles, a large number of citizens being present and taking part in the discussion. Sentiment was largely in favor of the passage of the ordinance, two objections only being urged with force. One objection was that the privy ordinance proposed was a merely temporary makeshift, and that the town should proceed immediately with the construction of a sewer system. The second objection was that the ordinance did not cover the danger from the septic tanks and cesspools in the city. The fact that most of the members of the city council lived in homes possessing either septic tanks or cesspools had a certain amount of weight in increasing the force with which this objection was waged by certain citizens. The consideration of the proposed ordinance was again postponed; and although the subject was being discussed with great interest by the whole citizenry, no action had been taken by the council at the time of the close of the work on November 1.

Dallas Center.—In the beginning of the work in the county a public meeting, largely attended, was held in the church in Dallas Center, and following the meeting certain prominent citizens displayed great interest in the work. In consequence, several liquefying privies of sanitary type were built, at the expense of especially interested private citizens, for demonstration purposes, in various parts of the town.

Immediately upon completion of the survey of the town the results of the survey were tabulated and a report to the city council prepared and presented on September 3. This report was not discussed at the next meeting of the town council, the attention of the council being much taken up with certain matters of paving and lighting at the time. Following the presentation of the report to the council, it was printed in the local paper under sufficient display to attract attention, and in the interval between the first and second meetings of the council an ordinance covering the recommendations made in the report was drawn and presented individually to the members of the council.

At the second meeting of the council, September 24, the ordinance was presented, together with the results of the sanitary analysis of a number of shallow wells in the town. The matter was debated at length, and an expression of opinion from the citizens being evidently desired by the council, a meeting of citizens was arranged at the local moving picture theater. On October 8, in the presence of a large number of the citizens, the whole matter was fully debated and all objections answered. The meeting was unable to agree on the desirability of the ordinance, in spite of no valid objection to it, although every citizen present declared his desire for an improvement of conditions. Sentiment seemed largely in favor of a bond issue for sewers rather than for any immediate method of dealing with the privy situation.

At the following meeting of the council, October 10, the matter was again debated, but no conclusion was reached, and the ordinance was still pending at the close of the work.

Dexter.—The town of Dexter presented sanitary conditions very similar to those of Woodward. The town was found to be without public water supply or sewerage system, but well able to have both.

After a public meeting, the survey was made and a report of findings submitted on October 13. At the instance of a physician member of the town council, this report was discussed by him before the council a short time before the close of the work. At the request of the council an ordinance was prepared covering the recommendations of the report and presented to the council.

Ordinance and report were printed in the local paper and were pending before the council at the close of the survey.

Minburn.—The town of Minburn, while somewhat smaller than those previously considered, having a population of only 322, had alone of all the towns in the county begun on its own initiative a movement for the improvement of sanitary conditions. It had passed and was actually enforcing an ordinance providing that all privies be provided with water-tight cement vaults, and that they be screened against flies. About one-third of the privies of the town were already provided with water-tight cement vaults, though not fly proof, and the larger part of the remainder, it was said by their owners, were to be made sanitary as soon as the level of the ground water fell sufficiently for the work to be done. In view of the fact that the type of privy proposed by this ordinance was satisfactory, a recommendation was made to the town council on September 10 that the enforcement of the existing ordinance be proceeded with vigorously. The occurrence of several cases of typhoid fever in one house in the town stimulated interest in the matter and at the time the survey was terminated the work for the sanitation of the privies of Minburn was proceeding at a good rate.

Van Meter, De Soto, Linden, Granger, Dawson, and Waukee.—These towns are smaller than those previously considered. Their populations in 1910 were as follows: Van Meter, 366; De Soto, 256; Linden, 315; Granger, 225; Dawson, 275; and Waukee, 340. The aggregate number of homes in these towns canvassed and surveyed was 658. None had a public water supply or sewerage system. Of the 658 homes, 15 were provided with water-closets connected with either septic tanks or cesspools, 7 had sanitary privies, 53 had no toilets of any kind, and the remainder had insanitary privies. The findings from the sanitary survey of each of these towns were presented, with recommendations, at a public meeting in each town. It was suggested that the several small towns combine to operate a public scavenger service. Local physicians and health officers were urged to use their best efforts to get carried out the program of sanitation. Due to the short time remaining for the work when these towns were reached by the survey, no more than this was undertaken to impress on the authorities and the citizens of these villages the need and the importance of the sanitary measures recommended.

SUMMARY OF SURVEY OF TOWNS.

In general it may be said that the results of the town surveys show a very striking lack of appreciation of the necessity for sanitation on the part of a population whose economic resources place the highest degree of sanitation easily within reach. Practically all the towns in Dallas County can afford to have the very best of sanitary conditions, including sewer connections for every house and safe water supplies for all homes. Instead, they depend upon primitive methods of disposal, exactly similar to those on the farms about them, and drawing and carrying their water for all purposes by hand from shallow wells in heavily polluted soil. The sanitary conditions of the Dallas County towns are identical with those of the surrounding rural districts, with the added dangers which come from the close association of privy and well made necessary by the crowded conditions of the towns.

The need for a prolonged campaign for sewerage and waterworks in the county is obvious. The experience of those connected with this survey indicated that there are many persons in every town who earnestly desire better conditions, but the slow movement of the governing bodies renders it necessary for success that a campaign be prolonged for many months and that success can only be obtained when abundant opportunity is given for the operation of the time factor.

TYPHOID FEVER PREVALENCE.

Country homes.—There had been no system of reporting cases of typhoid fever in operation in the county. The information which it was possible to collect regarding the prevalence of the disease in the county by the house-to-house canvass was much less complete than might be expected. The statements of the householders were in many cases hazy as to even the approximate dates, and in some instances the householder did not appear inclined to give information regarding the presence of the disease in his household.

Typhoid fever was recorded as existing in 14 families in 1914. In 2 of these families the cases were contracted and developed outside the county, leaving 12 families in which cases actually occurred in the county.

Cases were reported in 7 families in 1915, one being the same family in which there was a case in 1914. There were no deaths from any of the cases reported in the two years.

There was a very definite connection between 1 rural case and the outbreak of the disease in Adel during the winter months of 1914. On one farm there were 2 cases in succeeding years, with 1 case on the adjoining farm occurring between the two. This was the only definite example of a neighborhood infection.

Towns.—The following table shows the number of typhoid cases, by years, for the various towns recorded in the course of the house-to-house canvass:

Town.	1913	1914	1915	Total.
Perry	12	13	4	29
Adel	2	16	1	19
Dallas Center			1	1
Woodward		1		1
Redfield, Linden, Van Meter, Dexter				
Minburn			4	4
De Soto				
Waukee			2	2
Bouton, Granger, Dawson, Boonville				
Total	14	30	12	56

The returns show an annual prevalence for Perry and Adel and almost a complete freedom from the disease for the other towns.

Four of the cases in Minburn occurred two months before the beginning of the survey, and were all in one family. The fifth occurred in April, and was probably dependent in some way on the previous cases. The two in Waukee were doubtful in diagnosis, developing in visitors after a short visit to Waukee. There was no typhoid before or afterwards in Waukee.

The findings would lead one to believe that the sanitation of Perry and Adel would in all probability remove the two foci of infection in the county, and would in large measure tend to prevent the occurrence of a large number of cases in either towns or rural districts.

SANITARY MEASURES RECOMMENDED.

For the country homes the sanitary measures specially stressed were (1) cleanly disposal of human excreta, (2) protection of water supplies from potentially dangerous pollution, and (3) the storage and disposal of stable manure in a manner to prevent fly breeding.

For the towns the recommendations are set forth above in the reports made to the councils of the different towns.

COOPERATION.

Hearty cooperation in the work was given by the State board of health, the civic organizations, the local newspapers, the clergymen, the physicians, and many other prominent citizens.

The State board of health furnished two members of the regular survey force and sent to the county for a period of several weeks a field laboratory with a bacteriologist to make analysis of water supplies. The State health officer from time to time in the course of the survey visited the county, conferred with the officers making the survey, addressed public meetings, and in every other way possible gave enthusiastic assistance to the work.

The local newspapers gave excellent publicity to the work, publishing the full reports on the sanitary surveys of the towns.

Most of the public meetings were held in churches, the local clergymen encouraging their congregations to attend the meetings and to support the recommendations for sanitary improvements.

The town councils and the owners of the coal mines, though offering every facility for investigation, did not support to what appeared to be a warranted degree the sanitary measures indicated and recommended for their respective jurisdictions.

RESULTS.[1]

Country homes.—In the last part of the survey period groups of representative country homes in different neighborhoods were revisited to ascertain the degree of sanitary improvement accomplished subsequent to the first visit of the survey. The aggregate number of homes in these groups was 500. The findings on this round of follow-up visits are presented in the following table:

Sanitary improvements shown by revisits to 500 representative country homes.

	Occupied by owners.		Occupied by tenants.		Total number.	Per cent changes.
	Number.	Per cent changes.	Number.	Per cent changes.		
Homes revisited	438	....	62	....	500	....
Homes improved:						
Well only	30	6.9	4	6.5	34	6.8
Privy only	95	21.7	2	3.2	97	19.4
Both well and privy	20	4.6	....	....	20	4.0
Total wells	50	11.4	4	6.5	54	10.8
Total privies	115	26.3	2	3.2	117	23.4
Homes not improved:						
Occupant intends to improve	93	21.2	5	8.1	98	19.6
Not home first visit	38	8.7	....	....	38	7.6
Opposed to work	3	.7	....	....	3	.6
Conditions good at first visit	57	13.0	....	....	57	11.4
No changes made	102	23.3	51	82.2	153	30.6

Of the privies improved, about one-third had been improved to a degree for them to be classified as strictly sanitary (A) type, and the remainder were nearly of sanitary type.

The above table shows that approximately one in four of the farmers visited had made important changes in their sanitary equipment as a result of the first visit of inspection. About one in five stated their intention to improve conditions immediately. One in ten had approximately satisfactory conditions at the time of the first visit, and one in fourteen were not at home at the time of

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[1] Fig. 47.

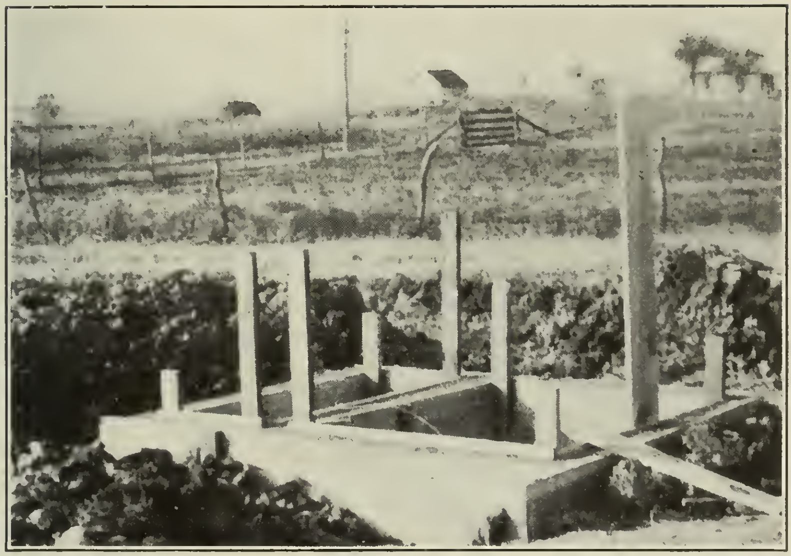

Fig. 47.—A septic tank under construction at a country home in Dallas County, Iowa, as a result of the sanitary survey.

the first visit. One in three had made no changes, and expressed no intention to do so. Three farmers were opposed to the work and would give no information, though one of these was actually at work on improvements at the time of the second visit.

The difference in results of visits to farms owned by the occupant and those occupied by tenants was striking. The owners of the tenant farms were reached only through letters, and naturally results with them were not as effectual as those obtained by direct interview with the owner. In addition, the owner had no real personal interest in the improvement, and even where the intention to improve was expressed the time was usually set in the future.

It should be noted that the season for farm improvements of all kinds was just beginning at the time the last survey was made. Practically all such improvements are made during the months of late fall, when the crops have been gathered. The unusually late maturing of the corn in 1915 tended to postpone work, and in addition the freshet stages in the rivers had delayed the obtaining of sand for concrete work. Many farmers were beginning the sanitary work at the time of the last visit to their homes and many more stated their intention of doing so as soon as the corn was cut.

Industrial settlements.—As soon as the facts regarding the sanitary conditions of the coal camps were tabulated, a statement was prepared showing the conditions in the industrial camps, and this statement was presented in person to the responsible manager of each company. At the same time, definite recommendations were made for improvement, and assistance in carrying out the program was offered. The interest taken by the coal mine managers seemed slight. Nothing was accomplished at three of the camps, but at one camp (High Bridge) a sanitary privy system was being installed at the time of the close of the survey.

Incorporated towns.—Little was accomplished in the towns, and this in spite of the fact that Adel, the second largest town, had suffered an explosive outbreak of typhoid fever in 1914. The sanitary ordinances suggested by officers making the survey as a rule were sidetracked on one pretext or another. To this general rule, however, the town of Minburn was an exception. The authorities of this town on their own initiative had passed and were enforcing a sanitary ordinance.

GENERAL CONCLUSIONS.

In concluding, it may be said that the results of the survey indicate that the people of the county, whether in city, town, or country, have never given to the subject of sanitation any great amount of thought or attention. There is no organized effort at sanitary administration, and no real machinery for carrying on any but the most rudimentary of sanitary procedures. While typhoid fever has not prevailed very extensively in the county in the past, there has been sufficient to demonstrate the need for an improvement in conditions. It is easily within the power of the people of the county to banish typhoid from the community and to receive the benefits which come in the improvement of general health from better sanitary conditions.

That disease and ill health can be markedly lessened and life made fuller and happier for every citizen of the county by an improvement in sanitary conditions is evident. That the people can be sufficiently interested in the subject to do the things necessary to place the county in sanitary condition is also evident.

The county needs, therefore, some regular and systematic form of sanitary administration which will carry on the work begun by the survey and build up in the county an adequate organization for proper sanitation of city, town, school, church, and rural home.

FOREWORD ON WORK IN 1916.

The counties surveyed in 1916 were Greenville in South Carolina, Floyd in Georgia, Tuscaloosa in Alabama, Obion in Tennessee, Clay in Missouri, and Cumberland in Illinois.

As in 1915, Surg. L. L. Lumsden was in general charge of the work and divided his time about equally among the six counties.

The officers in immediate charge of the county units were as follows: Asst. Surg. R. E. Wynne in Greenville, Asst. Surg. W. H. Slaughter in Floyd, Asst. Surg. K. E. Miller in Obion, Asst. Surg. H. C. Yarbrough in Clay, and Asst. Surg. W. C. Witte in Cumberland County.

The plan of work in 1916 was generally similar to that carried out in 1915. Additional data, for the collection of which painstaking effort was made, were in respect to the amount and character of illness in the households in the previous year and in respect to the number of persons in the households canvassed who were ill enough at the time of the visit to be prevented from following their pursuits.

The details of construction of the double-compartmented dry vault privy were worked out in the course of the studies in 1916. This type of sanitary privy appeared to meet better than any type of privy previously evolved the situation at a large proportion of the farm homes. It was advocated in the course of the work in the late summer and fall seasons of 1916 and a considerable number were installed by the property owners.

SANITARY SURVEY OF GREENVILLE COUNTY, S. C.

In response to a request from the State board of health it was decided to extend the sanitary survey in 1916 to a county in South Carolina. The State board of health, on account of its state of finances, appeared unable to furnish a part of the regular force for the detailed work of the survey. Therefore, in determining what county should be selected, weight was given to the outlook for active cooperation from county sources. The two counties in the State, Greenville and Richland, having whole-time county health officers, were given special consideration. From both counties active cooperation in the work was promised by county and town authorities, and by commercial and civic organizations. Greenville County appeared to offer conditions more nearly representative of the rural section generally of the State, and, therefore, that county was selected.

The survey of Greenville County was begun on March 8, 1916, and terminated November 1, 1916.

GENERAL CONDITIONS.

Greenville County is located in the northwest part of South Carolina, between the thirty-fourth and thirty-sixth parallels of latitude and the eighty-second and eighty-third meridians of longitude. The northern end of the county reaches the southern boundary of North Carolina. The land area is 761 square miles. The longest distance from north to south is 50 miles and from east to west 31 miles.

The northern third of the county is mountainous and the middle and southern thirds are hilly or rolling, merging into undulatory plains in the southeast part. From its picturesqueness and other pleasing features this county is referred to locally as "the Pearl of the Piedmont."

The top soil for most parts of the county is a red clay reaching a depth of 15 to 30 feet. In the northern third of the county strata of sandstone and granite outcrop in many places. In the southern third the top soil consists principally of loam. The northern, mountainous, third of the county is very sparsely settled.

The incorporated towns altogether cover an area of about 4 square miles. The only city in the county is Greenville, the county seat, with a population in 1916 estimated at 20,000.

According to the census reports, the population of Greenville County in 1910 was 68,377, of which 47,515 were white and 20,862 were negro. The population per square mile for the whole county was 89.9, and for the rural section 69.2. The urban population, all in Greenville, was 15,741. Of the population 68.4 per cent were native white of native parentage, 0.7 per cent were native white of foreign or mixed parentage, 0.5 per cent were foreign born, and 30.4 per cent were negro; 34,131 were males and 34,246 were females. Among persons 10 years old and over, the percentage given as illiterate was 17.9. The population increase in the decade 1900–1910 was 27.8 per cent and in the decade 1890–1900, 20.7 per cent.

The principal industries are agriculture and the manufacture of textiles. In 1916, 22 cotton mills were in operation in the county. Of these, 4 were located within the incorporated limits of Greenville city and the remainder in the rural section. Around the mills in the rural districts the settlements for the mill operators and their families are as a rule laid off as towns and owned and managed by those financing the industry.

The land generally is fertile and when properly cultivated yields bountifully. According to the census figures for 1910, there were in the county 2,573 farms operated by owners and 4,031 operated by tenants. The area in farms was 487,040 acres, of which 195,806 were improved and 180,651 in woodland. The value of farm land and buildings operated by owners was given as $9,035,429 and that operated by tenants, $7,165,295. The average area per farm was 62.7 acres, of which 29.5 were improved. The average value of farm land per acre was given as $32.85.

Cotton and cereals are the principal crops. Of all the land in cultivation in 1910, 70,000 acres were in cotton. This county has not yet been infested to any considerable extent by the boll weevil.

Besides Greenville, the incorporated towns are Greer, Fountain Inn, and Simpsonville, with populations (in 1910) of 1,354, 979, and 521, respectively, and West Greenville with a population in 1916 of about 500.

The county has good transportation facilities. It is traversed by three main line railways. The public (wagon) roads generally are good—over three-fourths of their mileage being improved. The improved roads are of the types known as "top-soil roads" and "sand-and-clay-mixture" roads.

PLAN AND SCOPE OF THE SANITARY SURVEY.

The work comprised (1) a canvass and sanitary survey of all the rural homes in the county; (2) a general survey of Greenville City and the four incorporated towns; (3) public addresses on the subject of sanitation, with lantern-slide illustrations, in all sections of the county; (4) distribution of literature on different phases of the subject of sanitation; (5) special surveys of industrial settlements; and (6) the epidemiologic investigation of cases of typhoid fever as they developed.

Headquarters were established in offices in the Chamber of Commerce Building in Greenville. These well-appointed offices, with telephone service and other conveniences, were furnished by the chamber of commerce without cost to the Government.

The county was divided into districts for the purpose of the rural survey and two men, as a rule, were assigned to duty in each of these districts.

At the beginning of the survey extensive publicity was given to the work by the local newspapers and through a series of public meetings. These introductory meetings were addressed by the officer of the Public Health Service in general charge of rural sanitation studies, by the State health officer, and by local citizens of prominence.

The personnel of the force engaged in the detailed work of the survey consisted of officers of the Public Health Service, the county health officer, and two officers—each detailed for a period of about two weeks—from the State board of health. The number of Public Health Service officers engaged averaged eight for the first five months and four for the remainder of the survey period.

A detailed canvass and sanitary survey was made of 11,751 homes. Of these, 8,752 were strictly rural, 758 in rural towns, and 2,241 in cotton-mill villages. A general sanitary survey, but not a house-to-house canvass, was

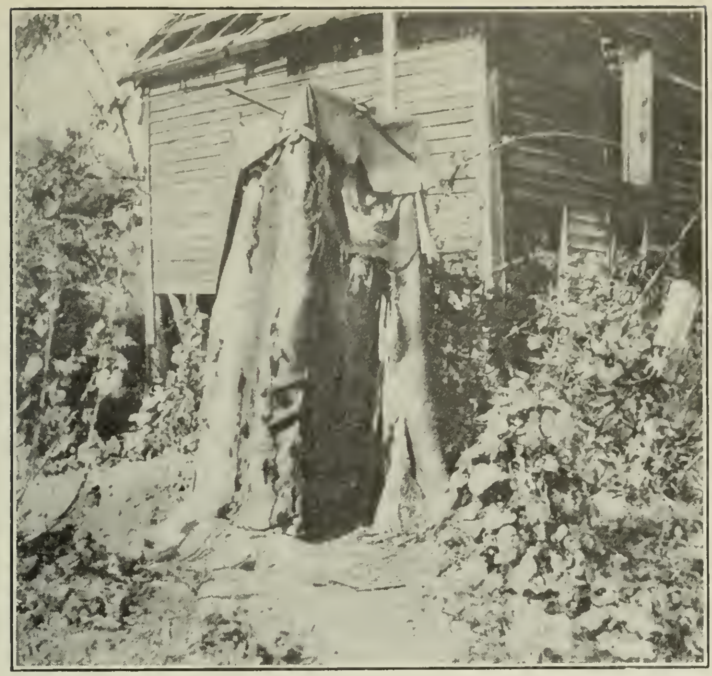

Fig. 48.—A primitive toilet, consisting of a stump of a hollow tree with a piece of canvas nailed over it, at a rural home in Greenville County, S. C.

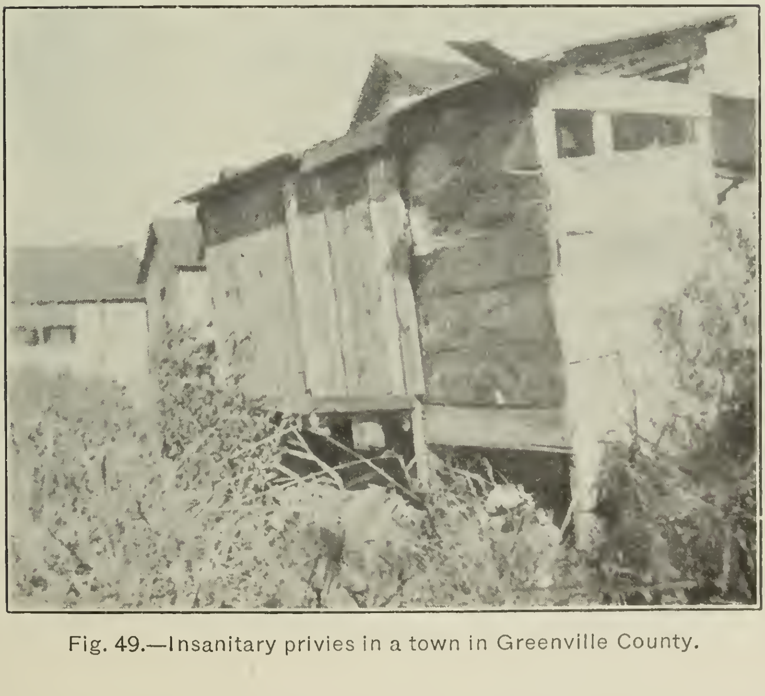

Fig. 49.—Insanitary privies in a town in Greenville County.

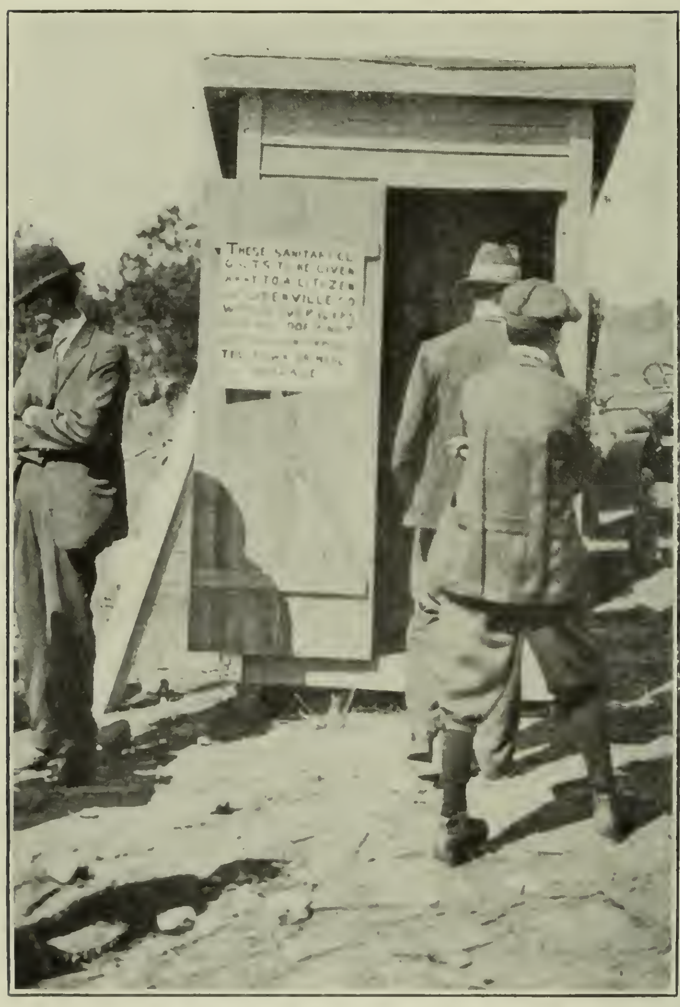

Fig. 50.—A model sanitary privy exhibited at a fair in Greenville County, S. C.

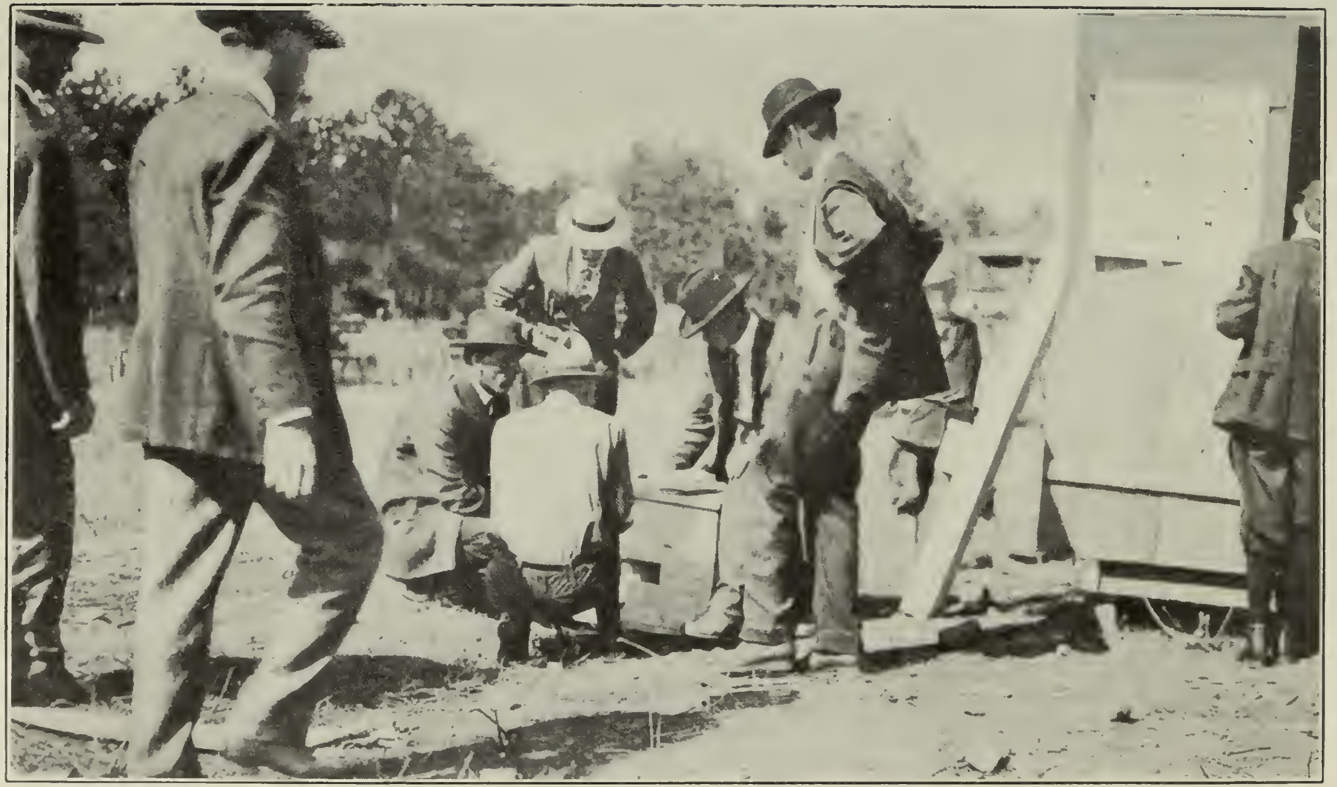

Fig. 51.—Demonstrating model sanitary privies at a fair in Greenville County, S. C.

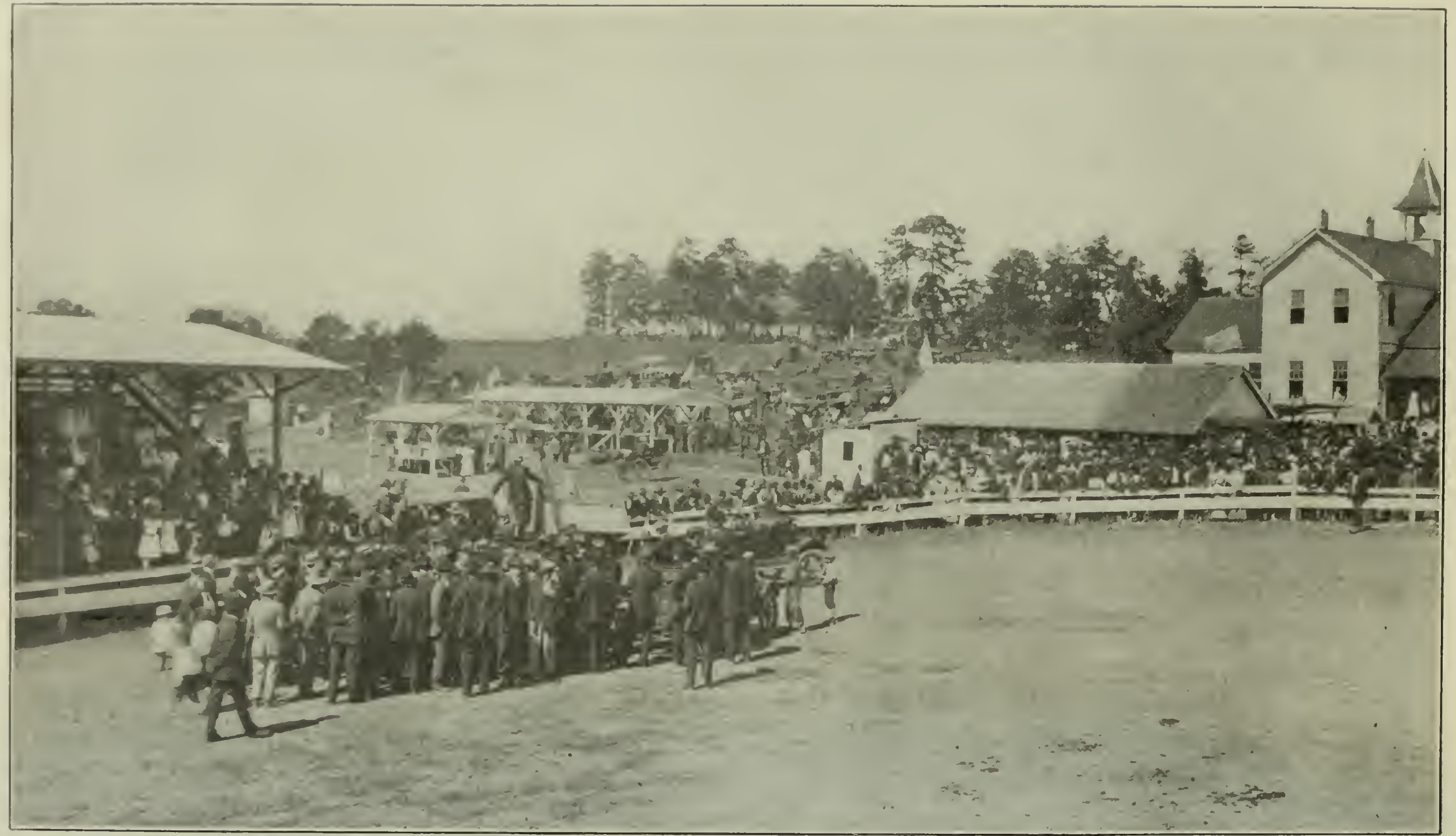

Fig. 52.—Awarding prizes (sanitary privies) to holders of winning numbers in the drawing participated in by hundreds of citizens at a fair in Greenville County, S. C.

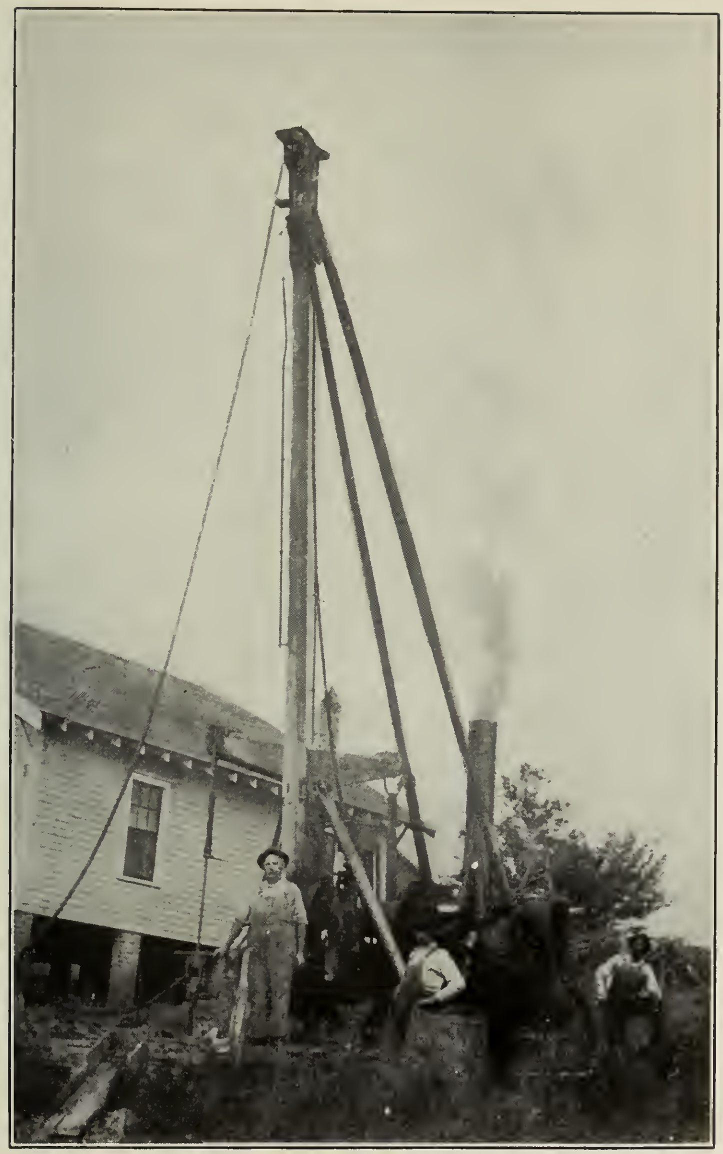

Fig. 53.—Boring wells at a cotton-mill village in Greenville County, S. C. At this village 13 bored wells of sanitary type equipped with pumps were installed to furnish water, and the polluted dug wells previously in use were filled up.

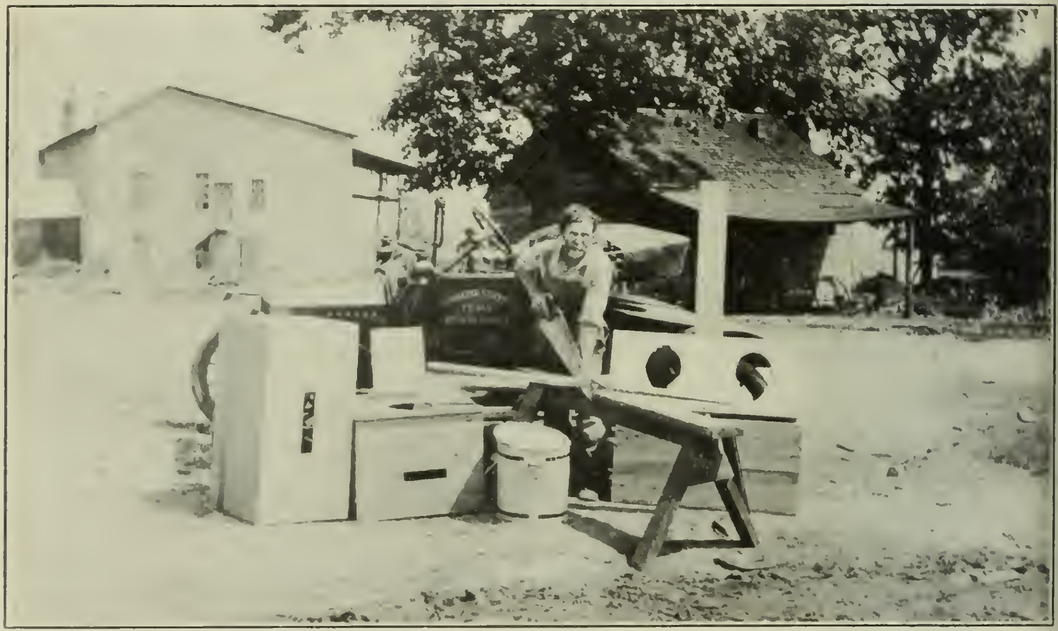

Fig. 54.—Building sanitary privy boxes at a rural lumber yard in Greenville County, S. C.

nade in Greenville. Of the strictly rural homes, 2,006 were revisited one or
nore times. All of the homes in cotton-mill villages and rural towns were re-
isited one or more times. The survey included, besides the study of homes,
nspection of factories, stores, schools, churches, post offices, and railway sta-
ions. Upon completing the surveys of incorporated towns, mill villages, and
ountry homes, reports with definite recommendations were made to those re-
ponsible for the conditions.

Public lectures on sanitation were given from time to time in different
eighborhoods. These were usually illustrated with stereopticon slides. In the
ourse of the work 123 public lectures were given. The attendance at these
ectures averaged about 200. Thus, besides the information received by the
ndividual citizens at their homes, about 24,600 of the people of the county
eard the facts of sanitation explained at public lectures.

FINDINGS AT FARM HOMES.

Eight thousand seven hundred and fifty-two rural homes, outside industrial
ettlements and incorporated towns, were visited. Of these, 3,207 were occu-
ied by their owners, 4,571 by tenants, and for 974 the ownership was not re-
orded.

Popular attitude toward the work.—At only 23 (or 0.3 per cent) of the homes
isited did the investigators fail to meet with a cordial reception. The citizens
enerally seemed anxious to cooperate in the study, and to obtain suggestions
bout needed corrections of insanitary conditions at their homes.

Race.—Of these dwellings, 72 per cent were occupied by white families and
8 per cent by negro families.

Sale of foods.—Foods, such as usually are eaten uncooked, including milk
nd milk products, fruits and vegetables, were sold more or less regularly from
,105 of the homes. Most of these foods went to local markets, but from 25
omes the foods were distributed through the channels of interstate commerce.

Duration of residence in county.—The length of residence of the head of the
ousehold in the county was less than 1 year at 331 homes, from 1 to 5
ears at 491, 5 to 10 at 413, 10 to 20 at 560, 20 years or over at 5,831, and not
ecorded at 1,126.

Number in household.—The number of persons in 7,691 homes at which the
umber in the household was enumerated was 39,564. Thus the average for
ach farm home was 5.1.

umber of rooms to house:	Dwellings.
With 1 room	124
With 2 rooms	815
With 3 rooms	1,944
With 4 rooms	2,439
With 5 rooms	1,279
With 6 rooms	1,018
With 7 rooms	491
With 8 rooms	309
With 9 rooms	112
With 10 rooms	73
With 11 rooms	7
With 12 rooms	9
Over 12 rooms	9
Not stated	123
Total	8,752

Appearance of residence.—Recorded as good for 2,157, as fair for 4,868, as poor for 1,727.

Construction of house:

	Dwellings.
Frame	8, 555
Log	46
Brick	27
Stucco	5
Cement	1
Stone	1
Canvas	2
Not stated	115
Total	8, 752

General cleanliness.—Recorded as good for 1,671 homes, fair for 5,074 homes, and poor for 1,851 homes. For 156 homes this datum was not recorded.

Cellar or basement.—Only 37 country homes had cellars, 8,715 homes having none.

Screening in summer.—At 974 homes the screening of dining room and kitchen was complete, and at 619 the screening of dining room and kitchen was incomplete, serving to exclude probably 50 per cent of the flies seeking entrance. At 6,931, or 81.31 per cent, of the country homes there was no screening of dining room, kitchen, or any other part of the house. At 228 homes information as to presence or absence of screening was not recorded.

Water supply.—Water for drinking and culinary purposes was obtained from wells at 5,494 homes, from springs at 1,390 homes, from town (piped) supplies at 378 homes, and for 1,490 homes the source of water supply was not recorded. At most of the homes at which the source was not recorded there was no source on the immediate premises and water was obtained from neighbors' supplies.

Of the 5,494 wells found in the rural community, 5,108 were dug and 386 were bored wells. One thousand three hundred and fifty-two wells were less than 50 feet distant from the privy, 1,378 were between 50 and 100 feet, 2,379 were more than 100 feet distant, and for 385 the distance was not recorded. One thousand two hundred and eight wells were within 50 feet of the stable, 1,214 were between 50 and 100 feet distant, 2,996 were more than 100 feet, and for 76 the distance was not recorded.

One thousand nine hundred and ninety-eight wells had curbings to carry surface waste, to some degree, away from the wells, and 3,496 had none. Two of these curbings were of clay, 547 of wood, 91 of tile, 483 of brick, 500 of stone, and 375 of cement. One thousand nine hundred and three wells were provided with casings, and 3,591 had none. Of these casings 11 were of wood, 437 of iron, 405 tile, and 1,050 stone. Twelve of the wells were less than 10 feet deep, 599 were between 10 and 25 feet deep, 3,755 were between 25 and 50 feet deep, 818 were between 50 and 100 feet deep, 21 were over 100 feet deep, and for 289 wells the depth was not recorded. Five thousand two hundred and five of the wells were equipped with buckets, 253 with pumps, and for 36 the means of lifting the water was not recorded. One thousand three hundred and fifty-four wells had tight platforms, while 4,140 had either leaky platforms or none.

There were 1,390 springs found in the rural sections of Greenville County. Of the number only 30 were provided with piping to prevent the dipping of buckets into the water source. From 1,360 the water was obtained by dipping.

Two hundred and seventeen springs had ditches to carry off surface drainage, while 1,173 had none.

Of all the water supplies (7,262) found in use at the country homes, in the opinion of the householder, 6,512 were safe, 347 unsafe, while at 403 homes the opinion of the householder was not stated. In contrast is the opinion of the inspector, who considered 478 safe and 6,784, or 93.42 per cent, unsafe.

Disposal of human excreta.—Of the 8,752 country homes surveyed, 132 had water-closets, 4,880 had privies, and 3,740, or 42.73 per cent, had no toilets of any kind.

Of the 132 water-closets, 6 emptied into septic tanks with sanitary disposal of effluents, 104 emptied into insanitary cesspools, 8 emptied into town sewers, and 14 discharged on the surface of the ground near by the dwelling.

Of the 4,880 privies, 21 were sanitary A-type privies, equipped with water-tight receptacles and of fly-proof construction, kept in good condition by regular and systematic cleaning. Forty-three homes were equipped with B-type privies, having water-tight vessels, but not fly proof; 113 with C-type privies screened against flies, but without receptacles to prevent soil pollution; 142 with D-type privies neither fly proof nor water-tight, but boarded up in the back to prevent the ingress of barnyard animals; and 4,561 were provided with E-type privies of the common open-back variety, the contents of which were freely exposed to flies, barnyard animals, and surface drainage (figs. 48 and 49).

Thus, of all the country dwellings, only 35, or 0.39 per cent, were equipped for sanitary disposal of human excreta.

At 4,816 of the homes there was a probability of privy contents getting into the yards, gardens, or water supplies by the scattering or drainage of the filth. In 319 instances there was obvious surface drainage of privy contents into the water supply.

Two thousand seven hundred and sixty-seven privies were reported used by all members of the family, 1,633 by women and children only, and for 480 the use of the privy was not recorded.

One thousand one hundred and eighty-five of the privies were cleaned weekly, 1,599 monthly, 188 semi-annually, 1,588 were never cleaned except by drainage, and by poultry and other filth-eating animals, and for 320 the frequency of "cleaning" was not recorded. When removed, the contents of 1,085 privies were scattered in woods or fields, 1,708 buried, 339 hauled off by scavenger, and for 1,748 this datum was not recorded.

Sanitary rating.—At 8,560 country dwellings a score was estimated and recorded on the basis of 50 for perfect excreta disposal, 30 for perfect water supply, 10 for perfect screening, and 10 for perfect general cleanliness, a total of 100. The average sanitary rating for the country dwellings in Greenville County, figured on the above basis, was 19.16. Three hundred and eighty-three were scored under 5, 3,602 between 5 and 15, 2,703 between 15 and 25, 1,709 between 25 and 55, 91 between 55 and 75, and only 72 were scored over 75.

Thus it is evident that the farmers of Greenville County, though progressive in many respects, were backward in the application of sanitary principles for the safeguarding of the health of their families.

Schools.—Ninety-five rural schools were inspected. Twenty-one had no privies, the pupils having to resort to the woods for places affording some degree of privacy at which to void their excreta. Of 74 schools with privies, 4 had sanitary A-type privies, 1 had a B-type privy, one had a screened privy with no receptacle (C type), 1 had a privy with neither screening nor vessel, but boarded up against animals (D type), and 67 had open-surface privies (E type).

The county school government was found to be vested in a county superintendent of education and about 150 school trustees, three for each school district. This made a large division of authority. The trustees of each district were responsible for the conditions at their schools, and to get sanitary improvements made at a school an agreement from the three trustees was necessary. The State board of health, however, had authority to order sanitary measures at schools.

County health administration.—The county health organization was a board of health consisting of two physicians and one layman, appointed by the county commissioners, and a whole-time county health officer, appointed by the [State board of health. The health officer is the executive officer of the county board, and composes the active part of the force. In view of the area and population of the county, it was evident that no one man could meet the urgent demands of the health situation.

FINDINGS IN COTTON-MILL VILLAGES.

In Greenville County there were at the time of the survey 22 cotton-mill villages. Four of them were within the incorporated limits of the city of Greenville and were included in the general sanitary survey of that city. Of the 18 in the rural sections, 2 extended over the county line, 1 having a majority of the dwellings within the county, and the other a minority (only 20) of its dwellings in Greenville County. In these two villages only the dwellings inside the Greenville County line were included in the survey. The aggregate number of homes canvassed and surveyed in the 18 mill villages outside the city of Greenville, but wholly or partly within Greenville County, was 2,241.

The mill villages were found strikingly similar in their general characteristics. Most of them were laid off as towns. The dwellings, rented by the mill operatives from the mill owners, were practically all of fairly good frame construction. The yards and streets generally were well kept. At a considerable proportion of the villages a good deal of effective work for the beautification of the premises had been done, and these villages, with a pretty arrangement of shade trees and trained vines, presented to casual observation an attractive appearance. In the most salient features of sanitation, however, the mill villages, as a group, were found on the first round of the survey to lack much. All of the mills were provided with water-closets for the use of the operatives while at work in the mills. The sewage from 16 of the mills passed, on its way to near-by streams, through some kind of a "septic tank." At only one of these 16 mills did the septic tanks appear adequate for effective septic action. The sewage from 2 mills, without treatment, was discharged into small creeks. In only 1 of the 18 mill villages was any considerable proportion of the dwellings connected with a sewerage system, and in this village at 8 dwellings not connected with the sewerage system insanitary privies were found in use. In 17 of the mill villages the dwellings occupied by the mill operatives and their families were found to be provided generally with insanitary privies. The privies in one village were mostly of B type, and in the other villages of E type. Most of the mill companies operated a scavenger service to effect weekly a partial cleaning of the insanitary privies.

The water for drinking and culinary purposes in the dwellings was obtained from dug wells at 9 of the villages, from drilled wells at 1, from community (piped) supplies at 3, and from the Greenville city (piped) supply at 5 villages. The Greenville city supply was good and the village piped supplies obtained from deep bored wells were usually good, but the water supplied from dug wells, as was the case in 9, or one-half the mill villages, was continally exposed to potentially dangerous pollution from numerous insanitary rivies near the wells.

Screening of dwellings was good at 2 of the villages, fair at 3, and poor, or ractically lacking, at 13 of the villages.

The more salient detailed findings from the canvass and survey of the 2,241 omes in the 18 mill villages were as follows:

Duration of residence.—The length of residence of the head of the household in the county was less than 1 year at 357 of the homes, from 1 to 5 ears at 434, 5 to 10 years at 278, 10 to 20 years at 306, 20 years or over at 78, and not recorded at 88. The duration of residence of the head of the ousehold in the dwelling being surveyed was under 1 year for 1,175, 1 to 5 ears for 628, 5 to 10 years for 220, 10 to 20 years for 99, 20 years or over for 9, and not recorded for 60. Thus, for industrial settlements, the population as fairly stable. Practically all of the mill employees were white, and of native tock.

Number of persons in household.—The number of persons in 2,172 of the omes at which the number of persons in the household was enumerated was 1,974—an average of 5.5 for each household.

Number of rooms to house:

With 1 room	3
With 2 rooms	163
With 3 rooms	392
With 4 rooms	1,106
With 5 rooms	213
With 6 rooms	296
With 7 rooms	25
With 8 rooms	25
With 9 rooms	9
With 10 rooms	3
Over 10 rooms	6
	2,241

General cleanliness.—Recorded as good for 308, fair for 1,719, and poor for 214.

Screening in summer.—The screening of dining room and kitchen in the dwelling was complete at 609, partial at 332, absent at 1,287, or 57.76 per cent, and not recorded at 13. Thus, there was little protection of foods and of mouths of sleeping children from contamination by flies coming from the ear-by numerous collections of exposed privy contents.

Water supply.—Of the 2,241 homes, 1,167 were furnished with water from wells on or near by the immediate premises, 3 with water from springs, and 1,071 with water from city or mill (piped) supplies. Of the 1,167 families obtaining water from family wells, the distance between the well and a privy or a stable, or both, was under 50 feet for 173, between 50 and 100 feet for 116, and 100 feet or over for the remainder. The majority of the family wells were shallow bored wells provided with iron, water-tight casing, which excluded subsoil seepage to some degree, but a considerable proportion of the bored wells and practically all of the dug wells were equipped with buckets instead of pumps, were without adequate curbing and platforms to shed waste water, and so were exposed to contamination about the tops. The investigators recorded 55 per cent of the families as being supplied with water safe for drinking purposes.

Disposal of human excreta.—Two hundred and fifty-three of the dwellings were provided with water-closets, 1,861 with privies, and 127 had no toilets of any kind.

Of the 253 water-closets, 237 discharged into sanitary sewers, 4 into sanitary septic tanks, 6 into insanitary cesspools, and 6 on the surface of the ground.

Of the 1,861 privies, only 34 were of sanitary A type, 179 were of B type, 12 were of C type, 75 were of D type, and 1,561 were of the grossly insanitary E type. Thus, of the 2,241 dwellings in the mill villages, only 275, or 12.27 per cent, were equipped for the sanitary disposal of human excreta. The proximity of the numerous open privies to unscreened dwellings, to yards and alleys in which children played, and to exposed sources of water supply, made the cotton-mill village situation serious from a health standpoint and highly objectionable from an aesthetic standpoint.

Sanitary rating.—Scored on water supply, excreta disposal, screening, and general cleanliness, the average sanitary rating of the 2,241 dwellings in the cotton-mill villages was 38.70. Seven were scored under 5, 151 between 5 and 15, 480 between 15 and 25, 1,254 between 25 and 55, 112 between 55 and 75, and the remainder 75 or over. Thus, it was evident from the findings that there was much need of sanitary improvements at the cotton-mill villages generally in Greenville County.

Most of the mill operatives were members of well-organized labor unions, but high-grade sanitary conditions for the protection of the health and lives of their families and of themselves had not been included among their demands.

FINDINGS IN GREENVILLE CITY.[1]

Greenville, the county seat, is the largest incorporated center in the county. In size it is the fourth city in South Carolina. The population at the time of the survey was estimated at 20,000. Almost encircling the city, but outside the incorporate limits, are 10 cotton-mill villages and the town of West Greenville. These give an additional population of about 10,000 in the vicinity included within a radius of about a mile of the outer limits of the city.

A general sanitary survey was made of the city as a whole, and a detailed house-to-house survey in the unsewered sections.

Greenville was found to present remarkably good sanitary conditions. Its public water supply, which constituted practically the sole water supply for all users in the city, was obtained from an uninhabited watershed on hills several miles distant from the city. The water was found to be ample in quantity and of excellent sanitary quality. All of the 4,000 dwellings, with the exception of 1,195, were found to be provided with water-closets connected with a water-carriage sewerage system. Every dwelling not connected with the sewerage system was found to be provided with a well-constructed, well-kept, and well-scavenged sanitary privy. Thus, this city has the distinction of being the only incorporated center included in the sanitary surveys of the Public Health Service which was found on the first round of inspection to have at every place of human abode equipment for sanitary disposal of human excreta.

The privies in Greenville had been converted from insanitary to sanitary type about 18 months before the period of the survey. The work had been done as a result of the energetic, intelligent, and untiring efforts of the then recently appointed whole-time city health officer. On the survey, practically all of the privies were found in a good state of repair and almost all of them were apparently being well cared for by their users. Each privy was provided with water-tight metal receptacles in a well-ventilated, fly-proof box forming the seat. The privy house in most instances, also, was screened effectively to exclude flies. All privies were cleaned at least once each week by a municipal scavenger service. In the scavenging, filled cans were replaced with clean empty cans, and the filled cans were covered with well-fitting friction tops and hauled by wagon to the place of disposal. Each disposal station was in a shed. There the contents of the cans were dumped into a cement box over a manhole of a sewer and washed down the sewer. The cans, after being cleaned, were dipped in a disinfectant solution and then were ready for redistribution to the privies. The fee collected for this scavenger work was $3 per year for each privy.

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[1] Figs. 50, 51, and 52.

Garbage and other city refuse were collected systematically and disposed of by incineration at two well-constructed and well-operated municipal incinerators.

The city health department, consisting of a whole-time health officer with a corps of assistants, was found to be well organized and remarkably efficient. Reasonably good supervision was exercised over milk and other food supplies.

With such sanitary conditions it was not surprising to find from the records that the rate of prevalence of diseases caused by filth-borne infections was remarkably low. The system of collecting reports of infectious disease appeared effective, and in the 18 months ending November 1, 1916, not a death from typhoid fever of local origin was reported. In the period, June 1 to November 1, 1916, not a case of typhoid fever of local origin was reported among the 20,000 persons composing the population of Greenville.

The sanitary rating given Greenville was over 90, on a basis of 100 as perfect.

With the good sanitary conditions in Greenville, the men engaged in the survey were able to point to the city as an example for the surrounding rural communities. This was the first opportunity of such a kind that the Public Health Service officers had had at the beginning of a survey of a county.

FINDINGS IN INCORPORATED TOWNS.

Besides Greenville the incorporated centers in the county were, with the number of dwellings in each, as follows:

Town.	Number of dwellings.	Town.	Number of dwellings.
Greer	440	West Greenville	102
Simpsonville	92		
Fountain Inn	124	Total	758

Of these four towns, Greer was the only one found to have a public sewerage system. This system reached only a small proportion of the town's area. Connected with it were a number of stores and other public buildings and 41 private residences.

West Greenville was supplied in part with water from the Greenville city public supply. At about one-third of the dwellings in West Greenville water from the public supply was used, and at the remainder water from private sources was used.

In Greer there were three public wells, protected by good iron casings and equipped with pumps. Water from these was used at most of the stores and at about 60 private homes. For the remainder of the dwellings in Greer water was obtained from private sources.

Simpsonville and Fountain Inn were without either a public water supply or a public sewerage system.

All dwellings in these four towns were canvassed and surveyed. The more salient findings at the 758 town homes were as follows:

Ownership of dwellings.—Two hundred and eighty-four of the homes were occupied by owners, 448 by tenants, and for 26 the ownership was not recorded.

Number of persons in household.—The number of persons in 731 of the homes at which the number in the household was enumerated was 3,533—an average of 4.8 for each household.

Number of rooms to house:

With 1 room	3
With 2 rooms	24
With 3 rooms	104
With 4 rooms	207
With 5 rooms	150
With 6 rooms	100
With 7 rooms	59
With 8 rooms	69
With 9 rooms	16
With 10 rooms	14
Over 10 rooms	12
Total	758

General appearance of dwelling.—Recorded as good for 331, as fair for 331, and as poor for 96.

Construction of house.—Seven hundred and fifty were frame, 5 were brick, 2 were stucco, and 1 was cement.

General cleanliness.—Recorded as good for 153, fair for 339, and poor for 266.

Screening in summer.—The screening of kitchen and dining room was complete at 383, partial at 82, and entirely absent at 293.

Water supply.—The private sources of water supply found in the towns consisted of 407 wells and 7 springs. Of these 414 sources, 129 were located within 50 feet of insanitary privies, 115 were between 50 and 100 feet from an insanitary privy, and the remainder were 100 feet or over from the nearest insanitary privy. About 50 per cent were protected to some degree from contamination through drainage by casings, tight platforms, curbing, or ditching. Of the 407 wells, 227 were equipped with buckets and 180 with pumps for lifting the water.

The investigators regarded the water supplies in use at 278 of the homes as safe, those in use at 410 of the homes as unsafe, and for 70 homes the opinion on the sanitary quality of the water supplies was not recorded.

Disposal of human excreta.—Sixty-one of the dwellings were provided with water-closets, 695 with privies, and 2 had no toilet of any kind.

Of the 61 water closets, 44 were connected with public sewerage systems, 4 with sanitary septic tanks, and 13 with insanitary cesspools.

Of the 695 privies, 50 were sanitary A type and the remainder—consisting of 8 C type. 21 D type, and 616 E type—were grossly insanitary.

Thus, of the 758 town homes. only 98, or 12.92 per cent, were equipped for sanitary disposal of human excreta.

One hundred and fifty-nine of the privies were cleaned by systematic scavenger service, with faulty methods, however, and for the remainder there was no systematic removal of contents, and such as was attempted was inadequate and insanitary.

Sanitary rating.—For the 758 town homes, the average sanitary rating given was 30.9 per cent. Forty-three of the homes were scored under 5, 130 between 5 and 15, 178 between 15 and 25, 326 between 25 and 55, 42 between 55 and 75, and 39 were scored 75 or more.

TYPHOID FEVER PREVALENCE.

Among the 55,071 persons in the households, exclusive of those in Greenville City, canvassed in the course of the survey, 4,181, or 7.6 per cent, gave a history of having had typhoid fever. The distribution of the persons giving a history of typhoid fever was as follows: Two thousand seven hundred and ninety-eight among 39,564 persons in the country homes; 1,918 among 11,974 persons in the mill villages, and 365 among 3,533 persons in the incorporated towns. Thus the rate, according to these figures, had been highest among those living at the time of the survey in mill villages, next among those in the incorporated towns, and lowest among those living in country homes.

The numbers of cases so recorded probably are below the actual, but relatively correct.

The following table gives the number of cases recorded in the course of the canvass as having occurred in 1914 and 1915:

Number of cases.

Year.	Country homes.	Mill villages.	Towns.	Total.
1915	188	88	16	292
1914	190	90	19	299
1913	163	48	8	219
1912	142	68	7	217

The following table gives the records of cases by months in 1915:

Number of cases.

Month.	Country homes.	Mill villages.	Towns.	Total.
January	5			5
February	4			4
March	3			3
April	5			5
May	6	4		10
June	10	11	2	23
July	39	17	1	57
August	39	19	5	63
September	39	15	3	57
October	12	9	1	22
November	16	3		19
December	7			7
Not ascertained	7	9	1	17
Total	192	87	13	292

These figures, incomplete as figures so collected must be, are sufficient to indicate at the rate of prevalence of typhoid fever in the rural section of Greenville County had been fairly high.

GENERAL MORBIDITY.

Among the 55,071 persons in the rural districts canvassed, 702, or 1.28 per cent, were recorded definitely ill at the time of the visit to the homes. The following table gives the distribution of the morbidity so far as it was recorded.

Age.	Number sick among—			
	39,564 in country homes.	11,974 in mill villages.	3,533 in towns.	55,071 in all.
0 to 5 years	74	....	14	....
5 to 10 years	48	....	5	....
10 to 15 years	25	....	5	....
15 to 20 years	23	....	....	....
20 years or over	329	....	25	....
Total	499	154	49	702

Practically all recorded in these findings as ill were definitely ill or ill enough to be incapacited for following their pursuits.

Effort was made in the course of the canvass of the homes to ascertain the amount of sickness during the calendar year 1915. The histories obtained were as follows:

Nature of illness.	Number of cases.			
	Country homes.	Mill villages.	Towns.	Total.
Abdominal tumors	1	....	....	1
Abscess, eye	....	1	....	1
Abscess, scalp	1	....	....	1
Accidents	1	2	....	3
Adenitis	....	3	....	3
Amygdalitis	26	23	....	49
Aneurism aorta	....	1	....	1
Apoplexy	1	....	....	1
Appendicitis	35	19	5	59
Arteriosclerosis	1	....	....	1
Asthma	15	6	....	21
Biliousness	1	....	3	4
Bladder disease	....	1	....	1
Blood poison	....	4	....	4
Bloody flux	1	....	....	1
Body trouble	....	....	1	1
Bone felon	....	....	1	1
Brain fever	....	1	....	1
Bright's disease	....	22	....	22
Bronchitis	7	2	1	10
Burns	3	2	1	6
Cancer	7	1	....	8
Carbuncle	1	1	....	2
Carcinoma	5	....	....	5
Catarrh, bowel	....	....	1	1
Catarrh, nose	1	....	....	1
Chicken pox	52	7	6	65
Childbed fever	....	2	....	2
Childbirth	4	....	....	4
Cholera infantum	36	....	1	37
Colds	10	....	1	11
Colitis	1	4	....	5
Congestion of brain	....	....	1	1
Conjunctivitis	....	1	....	1
Constipation	7	....	....	7
Coughs	....	1	....	1
Creatoxismus	2	....	....	2
Cretinism	1	....	....	1
Croup	2	....	....	2
Cystitis	3	....	....	3
Diabetes	....	1	....	1
Diarrhea	19	11	2	32
Diphtheria	35	4	6	45
Dropsy	....	....	1	1
Dysentery	92	58	3	153
Ear diseases	6	....	....	6
Eczema	3	....	1	4
Enteritis	6	....	....	6
Epilepsy	3	4	1	8
Erysipelas	17	....	....	17
Female trouble	39	20	3	62
Fractures	3	2	....	5
Furunculosis	3	....	....	3
Gall stones	4	....	2	6

Nature of illness.	Number of cases.			
	Country homes.	Mill villages.	Towns.	Total.
Gastric ulcer	1			1
Gastritis	22		2	24
Goiter		1		1
Grippe	219	51	26	296
Hay fever	2			2
Headaches	4			4
Heart disease	36	5	5	46
Heat stroke		1		1
Hemorrhage		1		1
Hemorrhoids	4	1	1	6
Hernia	2			2
Hysteria		2		2
Impetigo		1		1
Inanition		1		1
Indigestion	67	12	5	84
Infantile paralysis	1			1
Infected jaw	1			1
Kidney stones	1			1
Liver trouble	30	14	2	46
Locked bowels	1			1
Lumbago	2			2
Lymphadenitis	1			1
Malaria	128	68	5	201
Measles	26	19	8	53
Melancholia	1			2
Meningitis	3	3		6
Menopaus	1			1
Migrane		4		4
Miscarriage	4			4
Mumps	28	12		40
Nephritis	60		6	66
Nervousness	21		2	23
Neuralgia		2	4	6
Nose trouble		1		1
Operation	2		2	4
Osteomyelitis	1			1
Paresis	28	3	2	33
Pellagra	58	43	3	104
Peritonitis	1		2	3
Pleurisy	4			4
Pneumonia	208	88	9	305
Potts disease	1			1
Puerperal septicemia	7			7
Pulmonary hem			1	1
Pyorrhea alvelo	1			1
Rectal fistula		2		2
Rheumatism	84	25	5	114
Run down system	2			2
Scarlet fever	39	45		84
Sclerosed arteries			1	1
Senility	7			7
Septicemia	1	1		2
Shingles	1			1
Smallpox	12	9		21
Spinal disease	2			2
Stillbirths	2			2
Stomach trouble		19	2	21
Stricture	1			1
Summer complaint		23	2	25
Sunstroke	1			1
Syphilis	2			2
Throat trouble	7			7
Tonsilitis			5	5
Toothache	1	2		3
Tuberculosis	57	21	5	83
Tumor	3	1		4
Typhoid fever	192	85	15	292
Ulcer, leg	1	1		2
Ulcer, stomach		1		1
Uncinariasis	7	1		8
Unknown	26	4	1	31
Uterine disease			1	1
Vaccinia	1			1
Varicocele	1			1
Varicose ulcer	1			1
Varix		1		1
Vertigo	6			6
Volvulus	1			1
Whooping cough	114	50	19	183
Worms	16	1		17
Total	2,020	829	182	3,031

In recording these findings the diagnoses as stated by the persons interviewed were accepted and classified as nearly as they could be with certainty. In some cases the nature of the illness as it was stated is included in the list.

The record of morbidity obtained by the canvass is probably far from complete, but, as it is given, it may prove of interest for comparison with returns from a more intensive canvass for morbidity statistics.

SANITARY MEASURES RECOMMENDED.

For the country homes the measures especially recommended were (1) sanitary disposal of human excreta, (2) protection of water supplies against pollution, and (3) screening of dwelling to exclude flies and mosquitoes. At the homes of those in reduced financial circumstances and particularly among tenants, the advantages, the facility, and the economy of the Mosaic method of excreta disposal were stressed.

For the cotton-mill villages and the incorporated towns the measures especially recommended were (1) the immediate installation of sanitary privy systems, (2) the extension or the installation of water-carriage sewerage systems as soon as practicable, (3) the provision of ample and safe water supplies, (4) screening of dwellings, and (5) improved general cleanliness.

For rural schools, churches, stores, post offices, and railroad stations sanitary privies and proper safeguarding of water supplies were recommended.

For Greenville city the main recommendation made to the city authorities was to extend, so far as practicable, their scavenger service to the thickly built-up sections fringing the borders of Greenville. In these sections sanitary conditions were generally bad and were a menace to the citizens of Greenville. Going out some of the streets the city limits could be defined by the difference in sanitary conditions—particularly in respect to types of privies on the different sides of the line.

At the beginning of the period of the survey the writer, accompanied in most instances by the State health officer, the county health officer, or the city health officer of Greenville, called on the owners of most of the cotton mills and discussed with the the advantages—both economic and humane—of needed improvements in sanitation in their villages. The majority of the mill owners responded very promptly to the suggestions. The sequence of events at the mill villages is given under the head of "Results."

COOPERATION.

Good cooperation in the work was received from the State board of health, the county board of health, the city health officer of Greenville, the local newspapers, the town authorities, the majority of the cotton-mill owners, the commercial and civic organizations, the practicing physicians, the clergymen, the school authorities, the county fair associations, and influential citizens generally.

The State board of health furnished two men—each for about two weeks—to assist in the regular survey work. The State health officer visited the county from time to time to confer with the officers making the survey, and to introduce them to local conditions. He addressed a number of the public meetings, gave good publicity to the work, and otherwise helped in every way he could.

The county health officer worked zealously and diligntly as a regular member of the survey force.

Although there was little active work to be done in Greenville by the survey force, the city health officer gave the work in both the city and the county as a whole his strong support. He attended and addressed a number of public meetings held in the rural sections, and on many occasions accompanied the officers making the survey of towns and villages and advised with them and with town councils and mill owners about the sanitary measures needed locally. In the period of the survey he was elected health officer of the town of Greer and there vigorously enforced the sanitary ordinance which had been adopted on the recommendation of the officers making the sanitary survey.

The local newspapers gave excellent publicity to the work and strongly supported, editorially, the program of sanitation. In the two daily papers in Greenville there was throughout the period of the survey an average of one article a day on the health work.

The councils of the four incorporated towns adopted and enforced with more or less vigor the sanitary ordinances recommended.

The owners of all the 18 cotton-mill villages, with the exception of 2, heartily supported the work and as promptly as was practicable carried out the sanitary measure suggested.

The Chamber of Commerce of Greenville, appreciating the importance of county sanitation from a standpoint of the local business interests, gave its unqualified support to the work. It furnished without charge to the Government the offices used as headquarters for the work; it furnished and managed the details for the Greenville County Sanitation Celebration, and otherwise helped in every way it could.

The clergymen generally took an active interest in the propaganda for sanitation. Many of them on several occasions in the period of the survey adopted local sanitation as the theme for their regular sermons. A number of the public meetings held especially for lectures on health were in churches and were addressed by the pastors.

One of the particularly impressive regular sermons, attended by a large audience, had as its theme "The Gospel of Health," and as its text, "Now that ye know and do not these things, ye have sinned against God and man."

The following are excerpts from some of the sermons delivered by the local clergymen:

"This is one time when the great National Government is giving to the people splendid returns on their taxes by sending, through its health experts, advice to the very doors of our homes—to those of the humblest and the richest and of the white and the colored alike."

"My people, after hearing these facts brought out by the Government health doctors, you must realize that each of us is his brother's keeper."

"We are exceedingly fortunate in being citizens of one of the counties reached by the sanitary survey of the United States Public Health Service. I consider it a pressing duty of the National Government to send these trained men broadcast over our whole country to tell the people about God's law."

After a regular lecture in a church with a negro congregation, the negro pastor in closing the meeting said:

"My people, these honorable doctors have been sent here by God, and they are working as hard for us as they would for their own families."

On April 10 an "educational rally" was started by the county superintendent of education, the director of the Rural School Improvement League, and the State inspector of school improvements. At their request, one or more of the officers engaged in making the sanitary survey attended each of the rallies and addressed the meetings of school children and school patrons at all of the 53 graded schools in the county.

Among the notable events at the schools in the course of the survey was the presentation of eight theses by pupils—five girls and three boys—on the subject of "Typhoid-fever causation and prevention," as a part of the program in the commencement exercises at one of the large (the Fairview) rural schools. These theses were presented in contest for a prize offered by one of the officers making the sanitary survey in that neighborhood. The terms of the contest, arranged through the cooperation of the principal and the trustees of the school, stipulated that plain terms must be used. The audience, consisting of over 1,000 persons, listened in rapt attention while the plain facts about typhoid fever were read by the eight essayists. An interesting account of this event is contained in an article entitled "Life, death, and speech," written by Herbert Quick and published in The Country Gentleman of September 2, 1916.

Through the cooperation of the County Fair Association, sanitation was made a conspicuous part of the program at each of two fairs held in different parts of the county in the latter part of the period of the survey. Sanitary privies were provided for the use of the thousands of visitors to these fairs.

Full-size models of different types of sanitary privies, furnished personally by officers making the survey, were exhibited and demonstrated. Much interest was given by the visitors to the sanitary exhibit. The models were to be given away at the end of the show. To decide who should have the model sanitary privies, a drawing of numbered tickets was arranged. Hundreds of citizens took part in the drawing. After the winners were known, the models were placed on an automobile truck, hauled in front of the grandstand, and presented, before a large and enthusiastic crowd of spectators, to the winners. Over 6,000 persons at these two fairs visited the sanitation exhibit and had demonstrated to them in detail the construction of sanitary devices.

GREENVILLE COUNTY SANITATION DAY.

To celebrate the work accomplished in sanitation in the county, October 4, 1916, was designated as "Greenville County Sanitation Day." Elaborate preparations for the celebration were made by the Greenville Chamber of Commerce and by other commercial, official, and civic organizations. The celebration was held in Greenville. It was on the same order as the Wilson County celebration held at Fredonia, Kans., in 1915. Thousands of visitors, nothwithstanding rainy weather, attended the occasion. In the afternoon there was a very imposing street parade with over 100 "floats" presenting health legends and ideas. In the evening the local theater was filled to its capacity with a crowd to hear health talks by a number of distinguished visitors to the celebration. Among these were Congressmen Adamson, Lever, and Nicholls, Assistant Secretary of the Treasury B. R. Newton, and Surg. J. W. Kerr, of the United States Public Health Service, then Assistant Surgeon General. This meeting was a very enthusiastic one. It was to have been held outdoors along with an elaborate pyrotechnical display and band concerts arranged for the evening's entertainment, but on account of rain it had to be held indoors.

The sanitation celebration was given extensive publicity and it appeared to stimulate sanitary progress in the county.

RESULTS.

Farm homes.—Groups of representative farm homes in different neighborhoods, selected so as to furnish a fair sample of the whole county, were revisited to ascertain the degree of sanitary improvement accomplished subsequent to the first visit of survey. The aggregate number of homes in these groups was 2,006.

At 399, or 19.89 per cent, marked improvement in methods of disposal of human excreta had been effected.

The following table shows the extent of improvement found:

Number of homes.	Excreta disposal through—								Total improved.
	Privies of types—					W. C. with S. T.	M. M.	C and L.	
	A	B	C	D	L. R. S.				
Without toilets to	35	....	....	....	....	....	62	....	97
With grossly insanitary, uncared for E type privies to	193	15	19	35	4	1	....	35	302
Total	228	15	19	35	4	1	62	35	399

Legend:
W. C. = Water-closet.
S. T. = Septic tank.
L. R. S. = Highest grade sanitary privy.
M. M. = Mosaic method.
C. and L. = Cleaning and liming frequently.

Thus, at 295, or 14.70 per cent of the 2,006 homes sanitary methods of disposal of human excreta had been adopted in place of the crudest and most insanitary methods.

Besides the improvements in method of excreta disposal, progress had been made in the protection of water supplies and in screening of dwellings. At 102, or 5 per cent of the homes radical improvement had been made in water supplies. At 59, or 3 per cent of the homes the dwelling had been completely screened and at 6 or 0.3 per cent, screening had been carried from none to partial.

Schools.—At 19 of the schools at which insanitary E type privies were found on the first round of survey, high-grade sanitary toilets had been installed. Of the schools with improved toilets 9 had pail closets cleaned by systematic and frequent scavenger service, 7 had dry concrete vault privies, 2 had L. R. S. privies, and one had water-closets connected with a sanitary tank with proper subsoil distribution of effluent. The work at the schools was in progress with good prospects for rapid advancement when the survey was terminated.

Railroad station.—Several high-grade sanitary privies were installed in the place of grossly insanitary privies at the rural railroad stations.

Cotton-mill villages.—At 16 of the 18 cotton-mill villages in the rural section of the county, marked progress in sanitation was made in the period of the survey. All of the mill villages were surveyed, and a report of findings made to the owners within the first 90 days of the survey. At most of the villages the owners had the sanitary work started immediately after the reports of findings were presented. Thus, before the hot summer weather had arrived, very considerable progress had been made. By November 1, the work of installing sanitary privies at homes not already provided with sanitary toilets when the survey was begun had been completed or was rapidly approaching completion in 16 of the mill villages. Of the 1,966 dwellings in the 18 mill villages at which on the first round of the survey there were either insanitary privies or no toilets of any kind, sanitary privies with water-tight receptacles and of fly-proof construction had been installed for 1,441, or 73.3 per cent, by November 1. The 525 dwellings remaining with insanitary privies were located for the most part in 3 mill villages.

At one of these three villages a complete sewerage system was being installed with a properly equipped water closet and bath tub for every one of its 100 dwellings. The installation of the sewerage system with all connections made was completed about December 15, 1916. At this village, besides the installation of a complete modern system of water works and sewerage, an extensive drainage project with cement bedding of streams to prevent mosquito breeding was carried out—the total expenditures for sanitary improvements inaugurated during the period of the survey being $40,000.

In the two villages, respectively, with about 288 and 137 dwellings unprovided with sanitary toilets at the end of the survey, work of installing sanitary privies was begun in earnest in the spring of 1917 and was about completed by the midsummer of that year. At the larger of these two villages, the owners of which were dilatory about starting the needed sanitary work, typhoid fever was highly prevalent in the summer of 1916. With a population composing about one-fourteenth of that of the whole county, this village furnished about one-seventh of all the cases of typhoid fever occurring in Greenville County in the period June 1 to November 1, 1916.

In contrast with this village was another in the county at which typhoid fever was highly prevalent in 1915, but at which the sanitary improvements recommended—comprising a sanitary privy in place of an insanitary privy at every dwelling, and the installation of bored wells equipped with pumps in the place of dug wells equipped with buckets—were carried out in the spring of 1916, and in the summer and fall of that year not a case of typhoid fever developed in its population (fig. 53).

Besides the improvements in methods of excreta disposal, marked progress was made at the dwellings in the mill villages generally in screening and in general cleanliness.

The sanitary rating of the average mill-village dwelling was raised in the period of the sanitary survey from 38.70 per cent to 68.48 per cent.

At four cotton-mill villages in counties neighboring Greenville County the examples in sanitation set by the mill villages in Greenville County were followed in the summer of 1916, and in them sanitary privies were installed at all their dwellings.

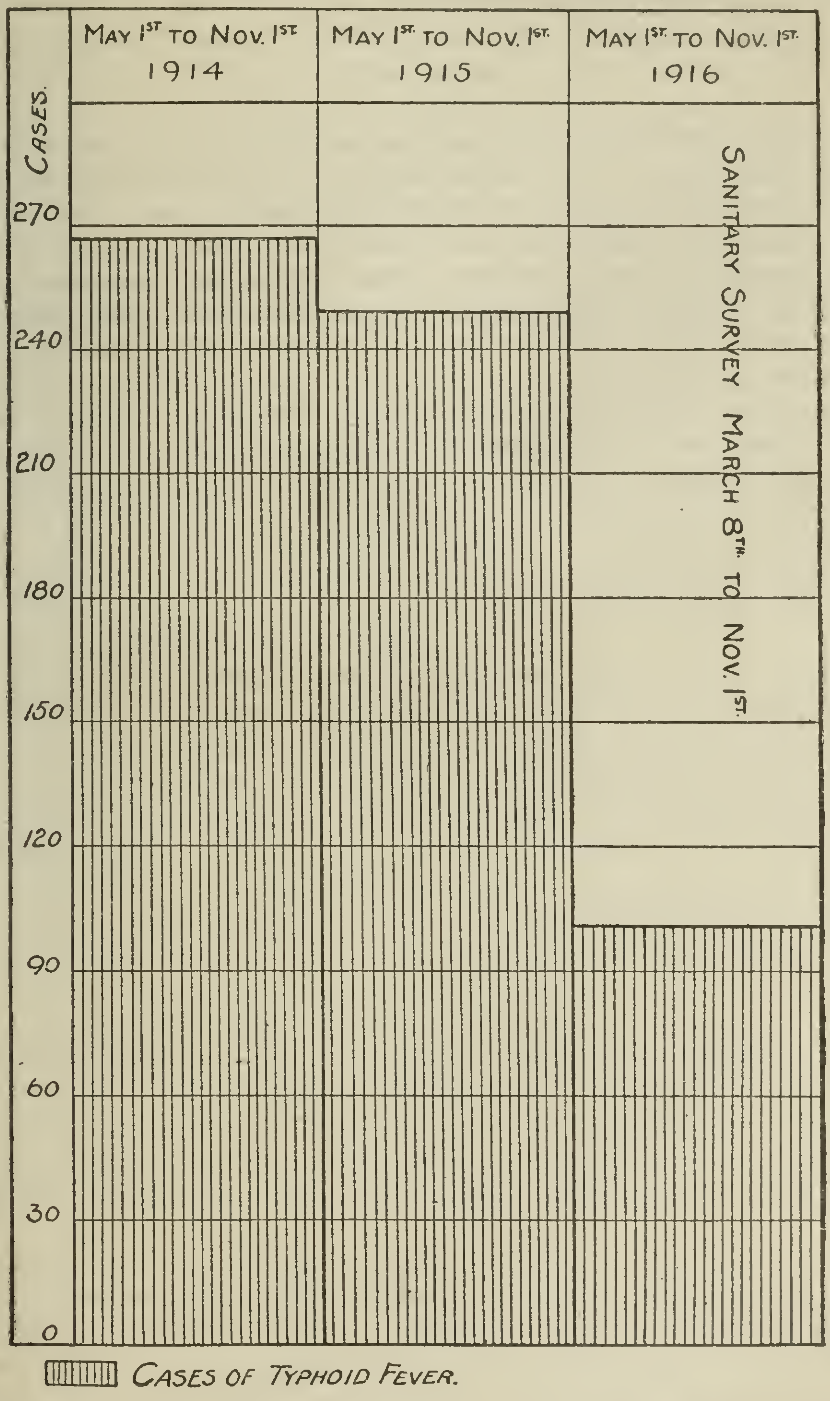
Incorporated towns.—In each of the four incorporated towns marked progress in sanitation was made in the period of the survey. The following table shows the sequence of events in these towns:

Name.	Approximate population.	On original survey.		Date of survey.	Date of report to council.
		Homes with privy.	Homes with water-closet.		
Greer	2,200	399	41	Mar. 29–30	July 3
Simpsonville	450	81	6	Mar. 17	Mar. 17
Fountain Inn	682	119	5	May 16	May 17
West Greenville	520	96	6	June 22	June 24

Name.	Ordinance effective.	Work of converting all privies into sanitary type.		Score original survey.	Score final survey.	Sanitary improvement by Nov. 1.
		Begun about—	Completed about—			
						Per cent.
Greer	Jan 1, 1917	July 3	Nov. 15	54	74	20
Simpsonville	Aug. 1, 1916	Mar. 20	May 20	40	76	36
Fountain Inn	July 15, 1916	May 20	June 9,	41	77	36
West Greenville	Sept. 1, 1916	June 28	Sept. 1	39	74	35

By November 1 in Simpsonville all of the 90 insanitary privies had been onverted into sanitary A type, in Fountain Inn 112 of the 124 insanitary rivies had been converted into A type, in West Greenville all of the 76 inanitary prives had been converted into A type, in Greer 32 insanitary privies had been abolished and replaced with water-closets connected with the sanitary sewer, and orders had been placed for equipment and carpentering to make all insanitary privies remaining in both Greer and Fountain Inn of sanitary A type (fig. 54).

CHART 13:- TYPHOID FEVER REDUCTION FOLLOWING SANITARY SURVEY IN GREENVILLE COUNTY, S.C.



Thus, of the 660 town dwellings found on the original survey not to be equipped with either sanitary privies or sanitary water-closets, 310, or 45.97 per cent, had been so equipped by November 1, 1916, and the remainder were so equipped within the next 60 days.

Typhoid fever reduction.—So far as could be ascertained there developed in Greenville County in the period May 1 to November 1 of 1916 only 101 cases of typhoid fever as against 249 for the corresponding period of 1915, the year before the sanitary survey (chart 13).

CONCLUSION.

At the time of the termination of the sanitary survey, November 1, 1916, Greenville County as a whole presented an excellent demonstration in sanitation for farm homes, industrial settlements, small towns, and cities. The public sentiment was excellent and the prospects for continued progress in sanitation appeared good. Were the county health force augmented to make it adequate to cover the large territory of the county there seems no room for reasonable doubt that this county as a whole would soon present a remarkably high standard of sanitation.

From the local conditions found on a brief resurvey in the summer of 1917 it appeared that Greenville County, S. C., could be regarded as one of the two or three rural counties in the United States presenting highest grade sanitary conditions.

SANITARY SURVEY OF FLOYD COUNTY, GA.

Floyd County was the first county in Georgia in which the position of whole-time county health officer was established. The appointee, designated as the county commissioner of health, took office on January 1, 1916. Soon thereafter, he visited Walker County, Ala., and saw something of the results of the sanitary survey of that county in 1915. He immediately filed with the Surgeon General of the Public Health Service an urgent request for a similar survey of Floyd County. His request was indorsed by the State board of health and was supplemented by petitions from the county medical society, the county board of roads and revenue, the Rome Chamber of Commerce, and the Woman's Club of Rome, and other civic organizations. Thus, active cooperation in the work seemed assured.

The survey of Floyd County was begun on March 8, 1916, and terminated November 1, 1916.

GENERAL CONDITIONS.

Floyd County has an area of 502 square miles, lies in the foothills of the Allegheny Mountains, in the northwestern part of the State of Georgia, and is bounded on the north by Chattooga and Gordon Counties, on the east by Gordon and Bartow Counties, on the south by Polk County, on the west by Chattooga County and the State of Alabama.

The contour of the land of the county varies from rather mountainous to rolling and flat. The average altitude is 680 feet. The soil formation consists of clay, loam, clay and loam combinations, and sand. Bauxite and iron ores are found, and outcroppings of limestone are noticed pretty generally throughout the county. The Etowah River in the eastern portion and the Oostenaula River in the northern portion unite at Rome, forming the Coosa River, which flows southwestwardly into northern Alabama.

Floyd County has a temperate climate, the maximum summer heat rarely exceeding 98°, and the minimum in winter seldom falling below zero. The average annual precipitation is about 47.6 inches.

There are two incorporated towns in the county, Rome and Cave Spring; and two industrial villages (cotton-mill settlements), Lindale and Anchor Duck. Practically the whole of the county is interlaced with good roads, many of which are macadamized. Four railroads serve the county—the Southern, the Central of Georgia, the Nashville, Chattanooga & St. Louis, and the Rome & Northern. Rome, the county seat, is the chief railroad center of north Georgia.

The population of the county in 1910, according to the census reports, was 36,736; 28.5 per cent of which was negro. Of the white population only 0.4 per cent were foreign born. The population increased 10.9 per cent in the decade 1900–1910, and 16.6 per cent in the decade 1890–1900. The urban population, all in the city of Rome, was 12,099. The number of persons per square mile was 73.2 for the whole county, and 49.1 for the rural section. The only incorporated center besides Rome is Cave Spring, with a population (in 1910) of 805. Of persons 10 years old and over, 14.5 per cent were recorded as illiterate.

Floyd County is essentially a farming section. According to the census figures, there were in the county, in 1910, 3,092 farms, covering 78.5 per cent of the county's area. Forty-eight and one-tenth per cent of the farm land were improved. The average number of acres per farm was 81.5, with 39.3 improved. The value of land per acre was given as $13.77, and the value of all farm property as $5,905,265. Thirty-six and six-tenths per cent of the farms were operated by owners, 62.8 by tenants, and the remainder by managers. The principal farm products are cotton, hay, vegetables, peaches, apples, and corn, and other grain.

The live-stock industry has lately come into prominence, especial attention being given to cattle raising. Several farms have herds of pure-bred Herefords.

Among other industries are the manufacture of cotton goods, agricultural implements, fertilizers, leather, wagons, and stoves, and the cutting of marble. There are several bauxite mines. The county claims to have 75 manufacturing establishments.

Several educational institutions are located in Floyd County: The Georgia School for the Deaf, a State institution, is in Cave Spring; The Berry School, a large private industrial school, in Mount Berry, about 6 miles from Rome; Shorter College, a private institution for women, near Rome; and Darlington, a preparatory school for boys, in Rome.

PLAN AND SCOPE OF SANITARY SURVEY.

The general plan of the work in Floyd County was the same as that followed in other counties of which complete sanitary surveys were made in 1916. Headquarters were established in the county courthouse at Rome, in the office of the county commissioner of health, and the work was done in active co-operation with that official.

The number of officers of the Public Health Service engaged in the survey varied from nine to three, and averaged for the whole period of the survey about five.

The work comprised (1) a canvass and survey of all dwellings in the rural sections, comprising the country neighborhoods, two cotton-mill villages and the town of Cave Spring; (2) a general sanitary survey—including house-to-house surveys in the unsewered sections—of the city of Rome; (3) inspection of school premises, churches, railway stations, post offices and stores in the rural section; (4) public lectures on the subject of sanitation, with lantern-slide illustrations, in all sections of the county; (5) distribution of literature on health and exhibition of models on sanitation, and (6) the epidemiologic investigation of cases of typhoid fever as they occurred.

The number of public lectures given in the course of the work was 111, with an average attendance of 116, making a total of 12,876 persons who heard the facts of sanitation explained at the public meetings.

In the strictly rural sections, exclusive of the city of Rome, the incorporated town of Cave Spring and the two cotton-mill villages, the number of homes surveyed in detail was 3,610. After the first round of survey was completed 2,614 homes were revisited to ascertain the degree of sanitary improvement accomplished as a result of the educational phase of the work.

The number of homes surveyed in the two industrial villages was 587; in Cave Spring, 157; and in Rome, 2,418.

FINDINGS IN RURAL SECTIONS.

Of the 3,610 dwellings visited in the rural sections, 261 were unoccupied, 1,281 were occupied by the owner, 2,005 were tenanted, and at 63 ownership of the occupied dwellings was not recorded.

Race.—At 2,421 of the homes the families were white, at 853 the families were negro, and at 336 the race of the occupants was not recorded.

Nationality.—At all but two of 3,330 homes at which the datum was obtained the head of the household was American born. The head of the household at one was English and at one German.

Residence in county.—The head of the household had lived in the county less than 1 year at 154 homes, 1 to 5 years at 328, 5 to 10 years at 273, 10 to 20 years at 384, 20 years or more at 1,808, and for 663 the length of residence in the county was not recorded.

Residence in dwelling visited.—The head of the household had lived in the dwelling visited less than 1 year at 1,005 of the homes, 1 to 5 years at 972, 5 to 10 years at 478, 10 to 20 years at 325, 20 years or over at 356, and duration was not recorded at 474.

Sale of foods.—From 215 of the homes foods—such as milk, fruits, and vegetables—were said to be sold regularly. From four of these, milk and other foods were distributed through the channels of interstate commerce.

Attitude toward sanitary measures.—Of all the homes canvassed at only 17, or 0.46 per cent, did a responsible member of the family manifest opposition to the plan and purposes of the survey. The citizens generally cooperated in the studies and appeared anxious to obtain suggestions about the sanitary improvements needed at their homes.

Number of rooms to house:	Dwellings.
With 1 room	20
With 2 rooms	330
With 3 rooms	900
With 4 rooms	922
With 5 rooms	495
With 6 rooms	283
With 7 rooms	116
With 8 rooms	57
With 9 rooms	14
With 10 rooms	19
With 11 rooms	2
With 12 rooms	15
Not stated	437
Total	3, 610

Number of persons to household:	No of homes.
With 1	64
With 2	425
With 3	522
With 4	537
With 5	502
With 6	387
With 7	275
With 8	216
With 9	156
With 10	70
With 11	47
With 12	18
With 13	10
With over 13	5
Not stated	376
Total	3, 610

Thus the number of persons in 3,229 dwellings at which the number was enumerated was 16,080—an average of 4.9 per household.

Construction of house:

Frame	3,108
Log	84
Brick	4
Stucco	8
Not recorded	406
Total	3,610

General cleanliness.—The general cleanliness was recorded as good for 876 homes, fair for 1,874 homes, poor for 442 homes, and for 418 it was not recorded.

Cellar or basement.—Thirty-six homes had cellars or basements, 3,146 had none, and for 428 the presence or absence of a cellar or basement was not recorded.

Screening in summer.—Only 544 of the 3,610 homes were found to be completely screened, 113 were incompletely screened, 2,567, or 79.96 per cent, were entirely devoid of screening, and for 386 the degree of screening was not recorded.

Topography.—One thousand five hundred and seventeen of the home premises were on sloping ground, 832 on flat ground, 88 on rolling ground, 764 on hilly ground, and for 409 the topography was not recorded.

Animals on premises.—At 1,172 homes cows were kept, at 933 horses, at 1,660 poultry, at 1,108 hogs, at 786 dogs, at 864 cats, at 929 all of these domestic animals were kept, and at 643 none of them were kept.

Stable manure.—Of all the rural homes in the county at which animals were stabled at only 41 was there found to be provision made to prevent stable manure from serving as a breeding place for flies.

Water supply.—Water was obtained from wells at 2,389 of the homes; from cisterns at 290; from springs at 433; from the (Rome) city supply at 147; from neighbors' supplies at 90; and at 261 information on the source of water supply was not recorded.

At 175 homes the source of water supply was down-hill from the privy, and at 211 it was down-hill from the stable. At 2,224 homes the water was removed from the well or cistern by means of a bucket; at 137 by means of a pump; and for 318 the means of hoisting the water was not recorded. Of the 2,389 homes at which wells were in use 2,321 had dug wells, 41 bored wells, 5 drilled wells, and for 22 wells the type was not recorded. Four hundred and fifty-nine of the sources of water supply were less than 50 feet from a stable; 483 were 50 to 100 feet distant; 1,654 were 100 feet or more from stable; and 1,014 were not recorded on this point. Six hundred and seventy-eight of the sources of water supply were less than 50 feet from an insanitary privy; 512 were from 50 to 100 feet; 1,264 were 100 feet or more from the privy; and 1,156 were not recorded on this point.

One thousand eight hundred and twenty-nine of the wells were less than 50 feet deep; 438 were between 50 and 100 feet deep; 21 were 100 feet or more; and 101 were not recorded on this point. Only 147 of the wells were protected by water-tight casing and by curbing, tight platforms, and other means to exclude subsoil and surface drainage.

Of the cisterns 185 appeared to be water-tight, and the remainder, according to the evidence, seeped.

Only 15 of the springs were protected to some degree by covering or by ditching to exclude surface drainage.

The families in 92 per cent of instances regarded the water in use at their homes as safe, while the inspector regarded such water as safe in only 21 per cent of instances.

Disposal of human excreta.—Of all the rural homes visited, only 64 were provided with water-closets, 2,174 had privies, and at 1,372, or 38 per cent, there were no toilets of any kind.

Of the 64 water-closets, 2 were connected with insanitary cesspools and 62—for the most part at residences on the outskirts of Rome—with sanitary sewers.

Of the 2,174 privies, 2,030 were of the most insanitary (E) type, allowing free access to flies and domestic animals; 130 were of D type, excluding domestic animals, but not protected against flies; only 3 were sanitary (A type), having water-tight receptacles, the contents of which were protected from flies, and allowing for proper ventilation; 4 had water-tight receptacles, but the contents not protected against flies (type B); and 7 had no water-tight receptacles, but privy contents were protected against flies (type C). Thus, of the 3,610 homes, only 65, or 1.80 per cent, were equipped for sanitary disposal of human excreta.

The distance of the privy from the kitchen at the different homes was as follows: For 604 homes less than 50 feet; for 588 homes between 50 and 100 feet; for 1,196 homes 100 feet or more, and for 1,222 the distance was not recorded.

Of the 2,174 homes at which there were privies, the privies were used, according to the statements obtained, by all members of the household at 1,291; by some, usually the women and children, but not all members of the household, at 486; and for 397 information on this point was not obtained.

At 38 of the 2,174 homes where privies were in use, the privies were cleaned by scavenger; at 1,265 homes, privy contents were buried; at 223 cleaning of privies depended on the contents being carried away by drainage; at 216 the contents were scattered; and at 432 no information on this point was recorded.

Schools.—Eighty rural schools were surveyed. The source of water supply for the schools was as follows: For 48 from dug wells; for 16 from cisterns, for 11 from public supply for Rome; for 2 from springs; and for 3 the source of water supply was not recorded.

Of the 80 schools surveyed, only 1 had a water-closet, 57 had privies, and 22 had no toilets. Of the 57 privies in use 55 were of the open-back surface (E) type, 1 was D type, and 1 B type.

Churches.—Forty-five churches were surveyed. The source of water supply for 16 was from dug wells, for 5 from cisterns, for 23 from the city supply, and one had no water supply on the premises. One church had a water closet, 9 had open-back surface privies, and 35 had no toilets.

Railroad stations.—Ten railroad stations were surveyed. Dug wells were the source of water supply at 2 of these stations; a cistern at 1; city water at 4, and 3 had no water supply. Four of the stations were provided with water-closets, 3 with open-back privies; 3 had no toilets.

Stores.—Sixty-four rural stores were inspected. In 12 the general cleanliness was good, in 48 it was only fair, and in 4 poor. Only 6 of the stores were completely screened. Six stores were provided with water closets, 7 had insanitary privies, and 51 had no toilets of any kind.

Dairies.—Twelve dairy farms were inspected. The source of water supply used in the handling of milk was from wells at 6 dairies, from a spring at 1, and from the city supply at 5. Eight were provided with open-back surface privies, 3 had sanitary plumbing, and 1 had no toilet of any kind. The protection of manure at practically all the dairies was found to be inadequate.

Only 1 dairy was found to have the milk room completely screened; 11 were only partially screened.

Sanitary rating.—At 3,610 of the rural dwellings a score was estimated and recorded on excreta disposal, water supply, screening, and general cleanliness. the average sanitary rating for these dwellings was 31.7 per cent.

FINDINGS IN ROME.

Rome is an enterprising city with an estimated population in 1916 of 15,000 inhabitants. It is located near the center of the county, at the confluence of the Etowah and Oostanaula Rivers, where they come together in the shape of a V to form the Coosa River. The drainage of the town is good. Most of the city is located well above the limits of the high-water mark of the rivers.

Disposal of human excreta.—The greater portion of the city is sewered, the untreated sewage being emptied into the Etowah and Oostanaula Rivers. A house-to-house inspection of the whole city revealed the fact that there were in use within the corporate limits of the city 999 open-back, grossly insanitary surface privies. These privies were located mostly in the unsewered sections, but a considerable proportion of them was found in the central part of the city. These privies were seldom, if ever, cleaned; no scavenger system was in existence. At varying intervals attempts at cleaning the privies were made by hired individuals, but even then the privy contents were usually buried on the immediate premises. In some instances it was noted that shallow open wells were close to privies, and into them the privy contents not infrequently gained ready access, either by surface drainage or by subsoil seepage. Many of the privies were located conspicuously on high hills and gave parts of the town in full view from some of the principal streets a very untidy appearance.

Water supply.—The public water supply of Rome was used by approximately 80 per cent of the population. The water was obtained from the Oostanaula River and treated with alum and passed through mechanical filters for purification. The plant was operated and owned by the municipality. The water was treated with alum at the pumping station and then lifted to a distance of about 208 feet to sedimentation basins located upon a high hill about a quarter of a mile distant from the pumping station. The first sedimentaiton basin had a capacity of about 2,000,000 gallons. From the first sedimentation basin the water passed into a second sedimentation basin, with a capacity of about 1,000,000 gallons. These two basins were built of concrete, and were apparently water-tight. They were in juxtaposition, a concrete wall intervening. From the sedimentation basins the water passed by gravity through mechanical filters. There were seven mechanical filters, four of the "Jewel" type, two of the "Roberts" type, and one built by the American Water Softening Co. From four to five of these filters were used each day. The used filters were said to be flushed on an average of about once every 12 hours. After being filtered the water passed to a clear water basin of about 370,000 gallons capacity, and thence it went by gravity into the mains for distribution.

About 1,250 gallons of water were consumed daily, giving a general average per capita consumption of about 80 gallons per day.

The employees of the city water works department on duty at the water plant appeared devoid of the necessary skill and training to operate the plant properly. No scientific methods were applied to determine the alkalinity and turbidity of the raw water for the purpose of determining the amount of coagulant to be used.

A casual inspection of conditions at the pumping station revealed the fact that the raw river water was grossly polluted. The intake pipe was found to be located only a few yards downstream from the outlet of a small creek bringing down the sewage from Berry School, an institution with an enrollment of about 400 pupils, and located about a mile from the point at which the creek emptied into the Oostanaula River. On the watershed of this creek were located a number of farm homes and also the village of West Rome, with about 200 residents. Many residences were located on the watershed of the Oostanaula River above the intake. Calhoun, a town of about 2,000 inhabitants, located about 25 miles above, emptied its untreated sewage into the Oostanaula River.

Samples of both raw and filtered water were sent to the laboratory of the Georgia State Board of Health for bacteriological examinations. The following table shows the results of the bacteriological examinations:

Date examined.	Source.	B. coli present in—					
		Sample No. 1.			Sample No. 2.		
		10 c. c.	1 c. c.	0.1 c. c.	10 c. c.	1 c. c.	0.1 c. c.
May 27, 1916	City hydrant..	Positive...	Negative..	Negative..	Negative..	Negative..	Negative.
July 11, 1916	.....do.........	...do.......	Positive...	...do.......	Positive...	Positive...	Do.
July 7, 1916	.....do.........	Negative..	Negative..	...do.......	...do.......	Negative..	Do.
Oct. 25, 1916	Raw water.....	Positive...	Positive...	....	....	....	
Oct. 11, 1916	.....do.........	...do.......	...do.......	....	....	....	

Thus it was evident that the city's public water supply, obtained from a polluted source and not subjected to adequate purification process, was not of sanitary quality.

Besides the public supply, 427 private sources of water supply for drinking and culinary purposes were found in use in the city. These consisted of 8 cisterns, 9 springs, and 410 wells. Most of the cisterns were of an approved type. None of the 9 springs was in any wise protected from surface drainage, and most of them were downhill from and nearby a number of insanitary privies.

The 410 wells ranged in depth from 10 to 100 feet, the majority of them being only from 10 to 50 feet deep. Almost all of the surface wells were obviously polluted from direct drainage and seepage from nearby privies. Bacteriological examinations of water from several wells gave evidence of marked pollution, *B. coli* being found as a rule in 0.1 c. c. amounts.

Garbage.—The methods of garbage collection and disposal were found to be unsatisfactory. Practically all the homes were supplied with containers for the collection of household refuse. It was noted, however, that very few of these containers had covers, and in warm weather they were not infrequently swarming with flies. The collection and disposal of garbage were carried on by the city department of public works. The garbage in some instances was hauled and dumped into one of the three rivers passing through Rome; in other instances dumped and burned; in still other cases dumped and left to rot in some hollow in or near the outskirts of the city.

Fly breeding.—Several public livery stables and numerous private stables were located in the city of Rome. It was noted that the removal of stable manure was infrequent, and consequently all of the stables were serving as fly-breeding foci. On May 18, 1916, an ordinance was passed covering the matter of the disposal of manure from the livery stables, but not from the private stables. This ordinance read as follows:

> Be it ordained by the city commissioners of Rome, and it is hereby ordained by authority of same, that from and after the passage of this ordinance, that the owner or tenant of every livery stable in the city of Rome shall be re-

quired to thoroughly clean said stable of all manure at least once every seven days, and remove said manure outside the city limits, or place it in a container wherein it will be inaccessible to flies.

On failure so to do, such owner or tenant shall, on conviction, be punished as prescribed in section 214 of the city code.

A large proportion of the homes were not completely screened, but most of the markets and restaurants were found to be well screened.

The Woman's Club of Rome in the summer of 1916 donated many flytraps, which were placed at designated places, especially at livery stables and restaurants.

FINDINGS IN CAVE SPRING.

In this town, with 157 dwellings, sanitary conditions generally were poor. There was no sewerage system nor public water supply. The town, for its population, spread over a large area.

Ownership of dwellings.—Of the 157 dwellings 62 were occupied by their owners, 91 by tenants, and for 4 the ownership was not recorded.

Race.—Ninety-two dwellings were occupied by white families and 65 by negro families.

General cleanliness.—Recorded as good for 52 dwellings, as fair for 73, as poor for 28, and not recorded for 4.

Screening in summer.—Thirty of the dwellings were completely screened, 15 were incompletely screened, and 112 were entirely devoid of screening.

Water supply.—Water for domestic purposes was obtained from wells by 123 families, from cisterns by 20, and from springs by 14. Twenty-two of the sources of water supply were down slope from near-by insanitary privies, and 14 from near-by stables. The distance between source of water supply and the privy was under 50 feet for 21, 50 to 100 feet for 54, and over 100 feet for the remainder. Only 15 of the wells were protected from drainage by watertight casing, curbing, and tight platforms. Only 11 of the wells were equipped with pumps. All of the wells but one were dug wells, and almost all of them were under 50 feet in depth. Eight of the cisterns were well constructed, and 12 of them were exposed to pollution through seepage. Seven of the springs were fairly well protected from surface drainage by curbing or ditching.

Disposal of human excreta.—At 147 dwellings privies were found and at 10 no toilet of any kind. All of the privies were of insanitary type, 128 being E type, 17 D type, and 2 C type.

There was no public scavenger service and efforts at cleaning privies were infrequent and unsystematic. Most of the removal of privy contents was left to poultry, drainage and seepage, and other natural agencies. When privy contents were removed for burial they were in most instances buried on the premises near by the privy.

Sanitary rating.—Scored on general cleanliness, screening, water supply, and excreta disposal the average sanitary rating of the dwellings in Cave Spring was 31.8 per cent.

Georgia School for Deaf.—The State institution, located at Cave Spring, was found to present generally good sanitary conditions except for one insanitary privy in the grounds, and a lack of screening for some of the buildings. The institution was found to have a piped water supply, obtained from a well-protected spring, and a modern, well-equipped plumbing system. The sewage was discharged into a large free-flowing creek running through the grounds.

FINDINGS AT LINDALE.

Lindale, an industrial settlement (cotton-mill village), had in 1910, according to the census reports, a population of 3,699. At the time of the survey the population was estimated at 5,000, 96 per cent being white and 4 per cent negro.

Lindale is served by two railroads, the Southern and the Central of Georgia. A small creek, Silver Creek, flows through the settlement.

Massachusetts Mills in Georgia are located at Lindale. This establishment, covering an extensive area, comprised three factory buildings and four warehouse buildings. Cotton goods were the main article of manufacture. The company employed an average of about 1,600 employees.

Five hundred and fifteen dwelling houses were provided by the company for the accommodation of its employees. Most of the dwelling houses were double and were occupied by two families. The dwelling houses were found of wooden structure, of one or two stories, well constructed, roomy, and well ventilated. Most of the dwellings were well screened, and the work of screening was in progress.

The premises were found clean and well kept; in fact, scrupulous tidiness was conspicuous on every hand. The drainage of the town was good. Some of the streets of the town, including the main streets, were paved.

Water supply.—The whole of the town was supplied by a public water supply. The water was furnished by a spring, which was well protected against surface contamination. The water was brought from this spring through a 4-inch pipe to a concrete basin located near the center of the town. This basin was 75 by 38 feet in area and was divided into two compartments. Several freely flowing springs in the bottom of the basin added to the supply. From the basin the water was lifted by steam pumps to a reservoir located on a high hill at the edge of the town. The storage reservoir was constructed of concrete and was apparently water-tight. It had a length of 310 feet, a width of 130 feet, and a depth of about 8 feet. It was divided into two compartments, one of which had a capacity of about 1,000,000 gallons, and the other a capacity of about 680,000 gallons. The water was distributed through two 8-inch mains from the reservoir and through laterals of 4 and 6 inches, which joined the main. Bacteriological examination of the water showed it to be of good sanitary quality.

Excreta disposal.—Inspection at the inception of the survey showed that each dwelling in the village was provided with a B type privy. Thus, soil pollution was prevented, but the contents of the privies were accessible to flies.

A well organized scavenger system, maintained by the company, was in operation. The privies were cleaned at least once a week, and the contents disposed of by burial at places well removed from any source of water supply. The privy receptacles were treated often and freely with a disinfectant solution.

Much attention was given by the management to the health and the general welfare of the people of the village. A free bathhouse was operated, a physician was employed to give professional care to accident cases, a nurse was provided, also by the company, to care for the sick, and to give advice and help in the matters pertaining to sanitation and personal hygiene.

Schools.—Lindale had a white public school, with an enrollment of 677 pupils. Fourteen teachers were employed. The length of the school term was eight months. The teachers were paid for five months' service from the general educational fund of the State of Georgia and for three months' service by the Massachusetts mills in Georgia. The company owned the buildings and the equipment, the cost value of which was $18,000. The school operated a kindergarten department, a manual training department, and a cooking school. The expense attached to the operation of these departments was borne by the company. An expert dietitian was employed to conduct the cooking school.

The school building was of secure and modern structure, two stories high, with 12 schoolroom units. The building was so constructed as to allow for an unobstructed skylight. Sanitary plumbing, with approved water-closets, had been installed. The sewage was emptied into a near-by stream, Silver Creek. An up-to-date heating system (hot water) was in operation. Both of these installations were made by the company during the year 1916, at a cost of $3,000 for the sanitary plumbing and $2,500 for the heating system. The school was served by the public water supply. Sanitary drinking fountains were distributed throughout the school. The playgrounds were spacious and well kept.

The company provided a one-room schoolhouse for the negro quota of school children of the settlement. In this school one teacher was employed and 32 pupils were enrolled. The building was equipped with approved types of desks and furnishings.

The upkeep of both schools as regards repairs and supplies, as well as janitor service, was borne by the company.

The pupils were required to be vaccinated against smallpox before being permitted to enter school.

Sanitary rating.—Scored on general cleanliness, screening, water supply, and excreta disposal the sanitary rating of the average dwelling in Lindale was 69 per cent.

The sanitary work found accomplished, in progress, and in immediate prospect for the protection of the health of the operatives and their families spoke well for the business management of this settlement.

FINDINGS IN ANCHOR DUCK.

Anchor Duck, the other cotton-mill village in Floyd County, is located in juxtaposition to the city of Rome. The establishment was found to consist of 2 large factory buildings and 72 dwellings. These dwellings, occupied by the mill operatives and their families, were owned and managed by the mill company. In the mills 650 operatives were employed.

The community water supply, owned by the mill company, was obtained from a safely constructed spring. The spring was well protected from surface drainage by concrete work. The water from the spring was pumped to a reservoir located on a high and isolated hill. The reservoir had just been cleaned and was being emptied at the time of inspection. The walls appeared to be in excellent condition and impermeable throughout. The water was passed through a modern and approved type of mechanical filter, which was installed in 1915. The water was subjected to a bacteriological examination about once every 60 or 90 days, and all reports of findings were favorable. Eight residences on the outskirts of the village were supplied with water from wells, most of which were polluted.

The company maintained a hygienically operated swimming pool and free baths for its employees.

The dwelling houses, provided by the company for the accommodation of its employees, were of wooden structure and were mostly of one story. The premises generally were clean. Large well-covered garbage cans were in evidence at all the dwellings.

Thirty-eight of the houses operated by the company were found to have sanitary plumbing; the remaining 34 were supplied with privies. The company provided a scavenger to clean the privies, and the privy contents were disposed of by being dumped into Silver Creek. After being emptied the cans were treated with a disinfectant solution.

These privies in the early part of the period of the survey of the county and before the detailed survey of Anchor Duck was made, were equipped with patented privy cans furnished by a commercial concern. These cans were found to be water-tight, but were not installed so that their contents were protected from fly invasion. Therefore, these privies were graded as type B.

Sanitary rating.—Scored on general cleanliness, screening, water supply, and excreta disposal the average sanitary rating for the dwellings in this village was about 63 per cent.

FINDINGS AT BERRY SCHOOL.

The grounds of this reservation extend over hundreds of acres and contain a large number of buildings. This remarkable institution was furnishing to its pupils, drawn from the rural districts of the South, among many other things of great value to them, an excellent local demonstration in rural sanitation. A sewerage system reached all parts of the grounds and the dwellings were equipped with well-appointed, modern plumbing fixtures. The dairy, the dormitories, the dining rooms, and the kitchens were models in sanitation.

The water supply was obtained from the public supply of the city of Rome, and was of questionable sanitary quality. The sewage was passed through septic tanks which were inadequate and the effluent from which was discharged into a small creek draining into the Oostanaula River. Excepting the water supply and the ultimate disposal of the sewage, the institution as a whole presented high-grade sanitary conditions.

TYPHOID FEVER PREVALENCE.

In Floyd County, as in other rural counties in Georgia, there was no enforcement of legal requirements for reporting cases of the infectious diseases, and, therefore, the prevalence of typhoid fever in this county prior to 1915 could not be determined from any existing records.

Among 20,062 persons enumerated in the homes in the rural section—comprising all parts of the county outside the city of Rome—in the course of the house-to-house canvass 1,242, or 6.1 per cent, gave a history of having had typhoid fever; of these 119 were recorded as occurring in 1915. This finding suggests that in the rural section of Floyd County the rate of prevalence of typhoid fever had been moderately high in previous years and that about 150 cases of this disease occurred in 1915.

In Rome a city ordinance requiring the report of deaths from all causes and of cases of infectious disease was not enforced. According to the records at the city hall the death rate from all causes in the city was less than 9 per 1,000 of population in 1915. The actual rate, judging by all evidence obtained in the course of the survey, was probably about 18. As the number of deaths from typhoid fever recorded in the city in 1915 was 5, the actual number probably was nearer 10. Taking 8 as a conservative figure would give the city a typhoid fever death rate for 1915 of about 53 per 100,000 of population. A typhoid fever rate at least this high would be expected in view of the insanitary conditions found to obtain.

GENERAL MORBIDITY.

Among the 20,062 persons canvassed in the house-to-house survey in the rural section, the number recorded as definitely ill at the time of the visit to the home was 193, or 0.96 per cent, which would give a remarkably low morbidity rate and was probably far from complete.

According to age and sex the persons recorded ill were as follows:

Age, years.	Male.	Female.	Total.
0 to 5	15	17	32
5 to 10	6	6	12
10 to 15	3	6	9
15 to 20		8	8
20 to 30	17	18	35
30 to 60	17	44	61
60 years or over	15	21	36
Total	73	120	193

The cases of illness from different causes recorded as occurring in 1915 were as follows:

Nature of illness.	Rural.	Anchor Duck.	Lindale.	Cave Spring.	Total.
Acidosis	1				1
Apoplexy	1				1
Asthma	1				1
Anemia			1		1
Appendicitis	9		1	1	11
Arteriosclerosis				1	1
Amenorrhea			1		1
Brights disease	1		1		2
Bronchitis	5				5
Brain abscess	1				1
Blood poison	1				1
"Bronchial Pn"	1				1
Billiousness	2				2
Cancer	3		1		4
Carcinoma of stomach	1				1
Chicken pox	2				2
Colitis	1				1
Catarrh head	1				1
Cystitis	1				1
Consumption	1				1
Colds	2				2
Colic	1		1		2
Diphtheria	2				2
Dysentery	3				3
Diabetes	1				1
Diarrhea	5				5
Dropsy	1				1
Debility	1			2	3
Dyspepsia				1	1
Erysipelas	2				2
Endocarditis			1		1
Female trouble	3		1		4
Fissure, rectum	1				1
Gas poison	1				1
Gonorrhea	1				1
Gastritis	3				3
Gall stones	1				1
Gastroenterostomy	1				1
Heart disease	3			1	4
Hernia	1				1
Heart trouble	2				2
Hip-joint disease	1				1
Hemiplegia	2				2
Hookworm			1		1
Ileocolitis	7		8		15
Indigestion	7		3		10
Influenza	3		1		4
Inflammation of the bowels	1				1
Infantile paralysis	1			1	2
Internal fever				1	1
Kidney trouble	3				3
La Grille	37			16	53
Liver disease	1				1
Malaria	106		11	6	123
Meningitis	6				6
Measles	13		3		16
Mumps	24				24
Nervous prostration	1				1
Neuralgia	2		1		3
Nephritis	2				2
Neurasthenia			1		1

Nature of illness.	Rural.	Anchor Duck.	Lindale.	Cave Spring.	Total.
Old age	1				1
Otitis media			1		1
Pleurisy	4		1		5
Pneumonia	75		17	1	93
Pellagra	17	1	3		21
Pain in side	1				1
Paralysis	3		2		5
Puerperal infections	1				1
Palpitation of heart	1				1
Prostatitis	1				1
Piles	1		1		2
Phthisis	1				1
Ptomaine poison	1				1
Rheumatism	9				9
Sciatica				1	1
Scrofula	1			1	2
Saproemia	1				1
Septicemia	1				1
Spasms	1				1
Stomach trouble	10			2	12
Shingles	1				1
Sepsis	2				2
Scarlet fever	3		4		7
Senility	1				1
Spinal meningitis	1		1		2
Tonsilitis	5		1	1	7
Tuberculosis	8		5	1	14
Tumor	1				1
Typhoid fever	95		10		105
Unknown	1			1	2
Worms	1			1	2
Whooping cough	14		9		23
Total	548	1	92	39	680

This record is probably far from complete, but even such as it is, it may give an idea of the relative, if not the actual, rates of prevalence of different diseases.

SANITARY MEASURES RECOMMENDED.

For the farm homes the measures especially recommended were (1) sanitary disposal of human excreta—the Mosaic method being stressed at the homes of those in reduced financial circumstances; (2) protection of water supplies against potentially dangerous pollution; and (3) screening of dwelling to exclude flies and mosquitoes.

For the industrial settlements the measures especially recommended were (1) immediate installation of a sanitary privy system with all privies converted into sanitary "A" type; (2) complete screening of dwelling; (3) extension or installation of water-carriage sewerage systems as soon as practicable.

For Cave Spring the installation of a sanitary privy system appeared to be indicated and at first this was recommended. On account of opposition from leading local citizens to a sanitary privy system, such installation did not appear feasible, and in the latter part of the survey period attention was directed to the great advantages to the town which would accrue from the installation of a complete public water supply and a water-carriage sewerage system.

For Rome the measures especially recommended were (1) the immediate installation of a plant for the adequate treatment of the public water with hypochlorite of lime; (2) the immediate installation of a sanitary privy system with an adequate systematic scavenger service operated by the municipality, and all insanitary privies converted into strictly sanitary type; (3) rigid and immediate enforcement of the law requiring all sewerable properties to be connected with the sewer, privies on such properties to be abolished and sanitary water-closets installed in their stead; (4) improved methods and system in the removal of stable manure, garbage, and other city refuse; and (5) rigid enforcement of the ordinance requiring prompt report of cases of infectious disease.

COOPERATION.

Good cooperation in the work was given by the State and county health departments, by the county medical society, by the county board of roads and revenue, by the chamber of commerce, the rotary club, the woman's club, and the ministerial association of Rome, by the local newspapers, by the authorities of the educational institutions in the county, and by many prominent individual citizens.

At the beginning of the survey the State health officer of Georgia visited the county, conferred with the officers making the survey, addressed a mass meeting in Rome, and strongly indorsed the work. The chemist of the State board of health on two occasions visited the county to make field surveys of water supplies and to collect samples of water for bacteriological examination. In the State laboratory at Atlanta, these specimens and others sent from time to time were examined.

The county commissioner of health worked zealously and unfailingly to further the success of the survey in every way he could.

To a large proportion of the public meetings he accompanied the Public Health Service officer and assisted in presenting the lectures. About 8,000 persons in the county were inoculated with antityphoid vaccine during the period of the survey. A large part of the inoculation work was done by the commissioner. The practicing physicians assisted in this—usually without making any charge for such service. The vaccine was furnished for the most part by the State board of health and a considerable proportion was supplied from the hygienic laboratory of the Public Health Service.

The county board of roads and revenue gave the work their hearty support. Resolutions adopted formally by this board were published and did much to inspire confidence in the work among the citizens throughout the county were as follows:

> *Resolved*, That we, the commissioners of roads and revenue of Floyd County, assembled in regular session this 3d day of April, 1916, do in the very strongest terms commend the faithful, persistent, and successful efforts of our health officer in being instrumental in securing a sanitary survey of Floyd County by the United States Government.
>
> That we indorse the good work that the U. S. Public Health Service is now doing in our county in conjunction with our county board of health.
>
> That we call upon the people of the entire county for their loyal cooperation with the county board of health and the U. S. Public Health Service in the great work in which they are now engaged, believing that this work of sanitation will not only mean the prevention of disease and the conservation of human life, but that Floyd County will be advertised through the publicity bureau at Washington to all sections of the United States and the civilized world as one of the most sanitary counties in the Nation and altogether a desirable place to live and be happy.
>
> Read and approved by the board of county commissioners in regular session assembled this 3d day of April, 1916.
>
> (Signed) J. G. Pollock, *Chairman.*
> (Signed) M. B. Eubanks, *Clerk.*

Within the first few days of the survey period the county medical society held a special meeting with nearly its whole membership present and passed a resolution strongly indorsing the plan and purpose of the sanitary survey and pledging the cooperation of the membership with particular reference to the prompt reporting of cases of typhoid fever and of other infectious diseases.

The chamber of commerce and the rotary club of Rome actively supported he work. The officers of the survey were invited frequently to appear before neetings of these organizations and also of the woman's club of Rome, to report he progress of the sanitary work and to indicate what more the organization ould do to further the progress. A special organization, which was very ffective in developing and coordinating public sentiment for sanitation, was ormed by a federation of the committees on sanitation appointed, respectively, rom the chamber of commerce, the rotary club, the woman's club, the ministers' ssociation and the county medical society.

The president of the rotary clubs in America, while a guest of the rotary lub of Rome, made local sanitation the chief topic of his address delivered efore a large audience attending the Redpath Chautauqua at Rome.

The governor of Georgia in a letter to the mayor of Cave Spring indorsed he sanitary survey work and urged the mayor to cooperate.

The local newspapers gave the work excellent publicity and, editorially, upported the program of sanitation recommended.

The county superintendent of schools cooperated heartily and effectively. Ie addressed a number of special meetings held in different parts of the ounty for discussion of health measures. On September 16 the local school rustees—60 of them—from the various school districts in the county assembled t the county courthouse and inaugurated a plan for sanitary improvements ncluding especially the installation of sanitary privies at the rural schools.

For the purpose of focusing the attention, and arousing the interest, of every oy and girl in the rural schools of Floyd County on health subjects, the superntendent of public instruction offered to the children of the junior and senior rades for the best essay on the subject designated, two gold medals, each to ave a value of not less than $10, as follows:

1. A medal for the child under 12 years of age writing the best essay on the ubject "King health and his enemies."
2. A medal to the child over 12 years of age writing the best essay on the subect "The value of health and how to obtain it."

The following prizes were offered, also, to the school children, by public-pirited citizens:

1. Five dollars for the best written statement of "The best ten reasons why loyd County should be made more sanitary."
2. Five dollars for the best essay on "The dangers of the fly and how we ay prevent their breeding on our premises."
3. Five dollars for the best essay on "The cause and prevention of typhoid ever."
4. Five dollars for the best essay on "Sanitary housekeeping and cooking."
5. Five dollars for the best essay on "The effect of diet on disease and ealth."

From the citizens' fund, also, a prize of $25 was offered to the famly whose rural home should be given the highest score in the course of the anitary survey. The competition for each of these prizes was keen and did uch in a general educational way.

Through the cooperation of the fair association an exhibit—including models f sanitary privies, septic tanks, protected wells and springs, a properly contructed dwelling, fly traps, etc.—was made a prominent feature of the North eorgia Fair, held at Rome, October 17–21, and attended by visitors from differnt parts of the State. It is estimated that fully 5,000 of those attending the air examined the models in this exhibit.

The Berry school furnished from its mechanical department full-size models of fly traps and sanitary privies for exhibit in Rome and other parts of the county throughout the period of the survey. A course of lectures on sanitation was given by the officers of the survey to the several hundred pupils at this school. The Berry school band furnished musical entertainment at a number of the large public health meetings in the county. The purposes of this remarkable institution and those of the sanitary survey were distinctly in harmony and the cooperation appeared effective.

At Lindale, following the completion of the installation of sanitary privies at all dwellings in the settlement and a general clean-up of the village, a resurvey was made of all the homes. October 25, 1916, the day the resurvey was to be made, was designated as "sanitation day," and was declared a holiday. To stimulate interest among the employees of the mills the company offered prizes for the two homes making the highest sanitary score in the resurvey. The family in the home making the highest score was given two months' house rent, and the one in the home making the next highest score was given one month's house rent.

RESULTS.

Farm homes.—Groups of representative country homes in different neighborhoods were revisited to ascertain the degree of sanitary improvement accomplished subsequent to the first visit of the survey. The aggregate number of homes in these groups was 1,878.

At 214, or 11.39 per cent, of these homes marked improvement in methods of disposal of human excreta had been effected. Among these it was found that in place of either grossly insanitary privies or promiscuous dissemination of human excreta about the premises the Mosaic method had been adopted at 15 homes, sanitary septic tanks with proper water-closet connections had been installed at 10 homes, and high-grade sanitary ("A" type) privies had been installed and were apparently being well used and well kept at 118 homes. Thus, at 143, or 7.61 per cent, of these homes, furnishing a fair sample for the whole county, sanitary methods of excreta disposal had been adopted.

Besides the improvement in methods of excreta disposal considerable progress had been made in the protection of water supplies. It was found that since the first visit of survey 93 wells, 16 springs, and 5 cisterns, an aggregate of 114, or 6.08 per cent, of the sources of water supply had been markedly protected against contamination by new casings, new curbings, the installation of pumps, new water-tight covers or effective ditching.

Four hundred and four, or 21.5 per cent, of the dwellings had been markedly improved by screening. Of these 312 had been completely screened and 92 had been nearly completely screened.

Industrial settlements.—At both of the industrial settlements marked progress had been made in the period of the survey.

At the Anchor Duck village all of the 34 insanitary privies had been thoroughly cleaned and equipped with a patented device which furnished a water-tight receptacle for the excreta, but which was not of such construction as to be well ventilated and to exclude flies entirely from the contents of the cans. The liberal use of disinfectant solution in these cans and the frequent scavenging, however, made these privies nearly sanitary.

In the Lindale mill village all of the 515 "B" type privies had been converted into strongly constructed, well-ventilated, high-grade ("A" type) sanitary privies. Disinfectant was used liberally in the cans and the scavenger service was excellent. The general cleanliness of premises was found of a high grade and the screening of dwellings had been nearly completed. On the last round of survey in the last part of October the sanitary rating given this village was over 90 per cent.

Rural schools.—At the termination of the survey the sanitary work at the schools had been in progress but a few days.

Cave Spring.—In this little town seven progressive citizens, early in the survey period, had installed at their homes high-grade sanitary privies in the place of insanitary privies. The town council, instead of adopting an ordinance requiring all homes to be provided with sanitary privies, after considerable deliberation, authorized an election on a bond issue for the installation of public waterworks and complete water-carriage sewerage system. At the election, held on August 31, 1916, the vote was 88 "for" and 12 "against" the issuance of bonds in the sum of $16,000 for the installation of waterworks, and 86 "for" and 14 "against" the issuance of bonds in the sum of $4,000 for the installation of a sewerage system. The bonds were promptly validated and marketed and by the early spring of 1917 the work of installation was reported well under way.

Rome.—In this city, notwithstanding the remarkably strong and general sentiment among the citizens for the needed improvement in local sanitary conditions, the progress of sanitary work—due entirely, it appeared, to a vacillating and peculiar policy of the city government—was slow in time and unsatisfactory in kind.

The condition of the public water supply with a recommendation for its improvement by the installation of a hypochlorite plant was formally reported to the city commissioners on April 27. This recommendation was given favorable publicity in the local press and was strongly urged by the business and civic organizations and by many prominent individual citizens; but no action on it was taken by the city commissioners until August 10. Then the plant installed was crude and its operation faulty. As a result the water was overdosed with the chlorine sometimes, and underdosed at other times. Bacteriological examinations showed that, though the treatment effected a considerable average improvement in the water supply, it was not efficient. The facts about the readily correctible faults in the hypoclorite plant were repeatedly presented to the city commissioners, but up to the time the survey was terminated (November 1) they had taken no steps either to improve the hypochlorite plant or otherwise to safeguard the city's public water supply from dangerous contamination.

The report made to the city commissioners on April 27 emphasized the unsightly, loathsome, and highly dangerous conditions engendered by the 999 insanitary privies in Rome, and contained a recommendation for the immediate establishment of an adequate municipal scavenger service, and for the adoption and rigid enforcement of an ordinance requiring all privies to be made and kept of strictly sanitary type.

Under the laws of the city an ordinance had to be passed on two separate readings before it might become effective. On May 12, 1916, the following ordinance was given its first reading by the city commissioners:

Be it ordained by the commissioners of the city of Rome, and it is hereby ordained by authority of same:

1. That beginning on the first day of June, 1916, the owners of any real estate n the city of Rome where surface closets are in use shall be required to pay the sum of one dollar ($1) per quarter a closet for each family for the purpose of having the same cleaned by the sanitary authorities of said city. Said amount to be due and payable in advance on the first day of January, April, July, and October of each year.

2. Should such amount not be paid when due, the secretary of the commissioners shall issue execution for the same in the manner as tax executions are issued, which may be levied on any property owned by the person, against whom such amounts are assessed.

Be it further ordained that every property owner on whose premises surface closets are used, shall, within 30 days after the passage of this ordinance, install at his or her expense such closets as shall be required by the sanitary inspector of said city, and shall screen the same to the satisfaction of the sanitary inspector. Failure to comply with the orders of the sanitary inspector as to the construction and screening of closets shall subject the offenders, on conviction, to be punished as prescribed in section 214 of the city code.

Be it further ordained that all ordinances and parts of ordinances in conflict herewith be, and the same are hereby, repealed.

A motion to pass the above ordinance was carried.

On May 18, 1916, this ordinance was read the second time and adopted.

On May 26, 1916, at a called special meeting of the commissioners, a counter-ordinance for the rescindment of the above sanitary ordinance was put on its first reading. It was necessary for this rescindment ordinance to pass a second reading before it could become effective.

On June 2, 1916, the rescindment ordinance was to have been given its second reading, but due to the protests of many citizens interested in the welfare of the city, final action on the rescindment ordinance was deferred.

On June 10, 1916, a large number of the leading citizens of Rome, representing the best of the professional, financial, and political interests of the city, attended the meeting of the city commissioners. At this meeting it was made clear to the city commissioners that they should not be guided in this very important matter by a few unscrupulous property owners, and that the vast majority of the people of Rome were alert to the situation, and were determined that their interests and the general welfare of the city be considered over and above the desires of a few individuals who short-sightedly might be exerting influence to save themselves from the expenditure of a few dollars regardless of consequences to human health and human life.

This meeting was a striking demonstration of a citizenry aroused for the cause of adequate sanitation and health protection. The commissioners' assembly hall was crowded to its utmost capacity and the lack of sufficient standing room caused many interested in the cause to remain in line outside the door. There were present some who were supposed to represent the opposition to the sanitary measures, but only one of these hinted that the enforcement of the sanitary ordinance might be somewhat of a hardship upon him. Practically all the citizens at the meeting on a rising vote, asked for by the first commissioner, expressed themselves as being favorable to increase in taxation, if necessary, in order that the measures for better health and conservation of life might be carried out. The commissioners unanimously voted for a tabling of the ordinance under consideration for the rescindment of the sanitary ordinance. Thus the sanitary ordinance was continued in operation.

In discussing ways of carrying out the ordinance, the following report by the two commissioners appointed as a committee for the purpose was submitted:

We, the committee appointed by First Commissioner Pruden, night of June 2, respectfully submit the following recommendations:

1. That a public scavenger service be established at once and operated by the city for the proper collection and disposal of privy contents.

2. That for the operation of such scavenger service a fee of $1 per quarter for each family, payable in advance, be collected from the owner or occupant of each property on which a privy is maintained.

3. That the ordinance requiring all privies to be made of sanitary type be rigidly and promptly enforced.

4. That water-tight metal receptacles, cylindrical in shape, approximately 15 inches in height and 15 inches in diameter, of 22 gauge, be supplied by the city for use in the privies.

5. That the cost of lumber, screening, carpentering, and all other things besides the receptacles to make the privies of sanitary type, be borne by the owners of the property on which the privy is located.

6. That bids for the supply of the receptacles be asked for, that the bids be opened by the commissioners, and the contract let to the lowest bidder.

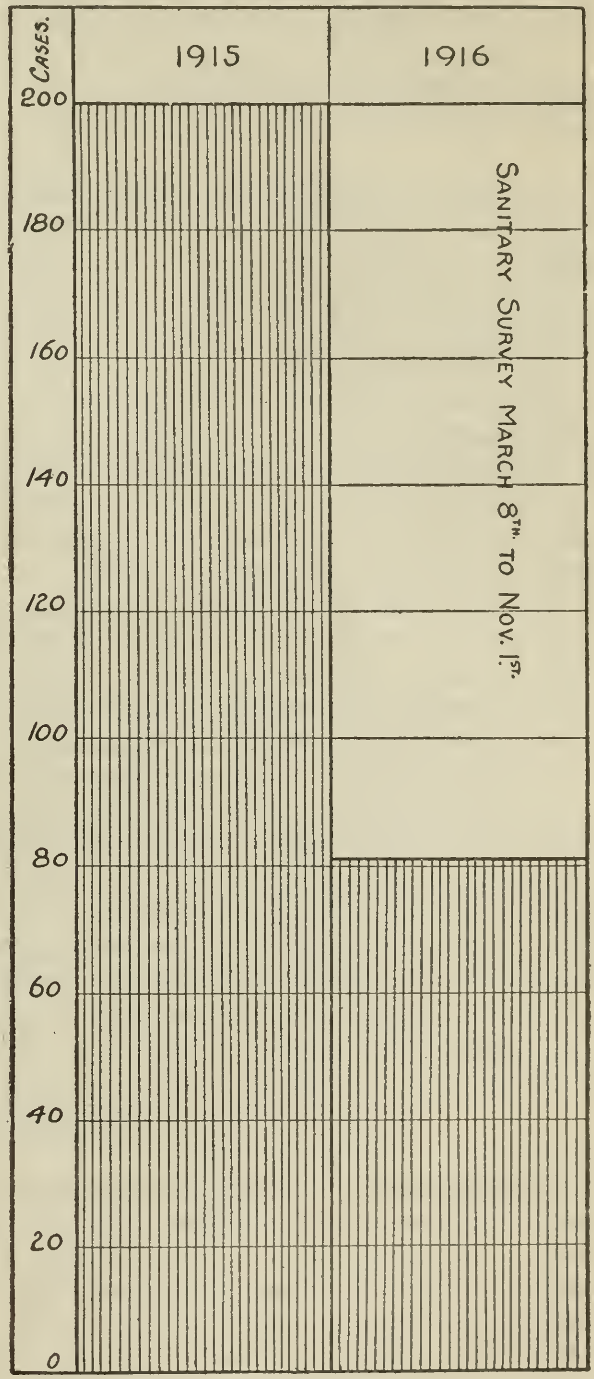
7. That four stations be established for the discharge of privy contents through the city sewers, viz: One in East Rome, to be emptied into Silver Creek; one in South Rome, on Shady Side, to empty into Coosa River; one in North Rome, near the W. & A. Railroad, and one into the sewer near the present dumping ground.

8. That in the collection and disposal of privy contents a disinfectant solution, recommended by the city physician, be used under direction of our sanitary inspector.

Notwithstanding the report, which embodied the principles recommended by the sanitary officers, the commissioners before they adjourned, but after the crowd had gone, closed a contract with a commercial concern for purchase by the city of 1,000 patented privy-can devices. This device was the same as that installed in the privies in the Anchor Duck mill village.

By the latter part of October about 400 of these devices had been installed by the municipal authorities, but at the expense of the property owners. The devices in practice furnished a marked improvement over previous conditions, but, due to insufficient ventilation and to a lack of adequate fly proofing, did not prove satisfactory. A report of this finding was left with the city commissioners and with the citizens' committee.

CHART 14:—TYPHOID FEVER REDUCTION FOLLOWING SANITARY SURVEY IN FLOYD COUNTY, GA.



The municipal scavenger service was established, and it was carrying out the method recommended for the collection and disposal of privy contents. This was a big advance over previous conditions.

According to the evidence there were, as a result of the official dilatoriness, a number of cases of serious illness and some deaths in the city of Rome in the summer and fall of 1916 which might have and which should have been prevented.

Typhoid fever reduction.—In 1916 the number of cases of typhoid fever reported for the whole of Floyd County—including rural and urban sections—was 81. So far as could be ascertained from a careful and constant study of the situation, the report of cases was practically complete. This number as compared with the approximate number, viz. 200, occurring in 1915, shows a wholesome reduction for the year of the sanitary survey (chart 14).

The distribution of cases in 1916 by months of onset and according to race of persons affected was as follows:

Race.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
White	1	....	15	19	11	9	1	5	1	62
Negro	1	1	2	2	9	2	2	....	....	19
Total	2	1	17	21	20	11	3	5	1	81

The rate of prevalence for Rome was considerably higher than that for the rural section.

In the Lindale cotton-mill village, with a population of about 5,000, and with reasonably good sanitary conditions obtaining from the advent of warm summer weather, not a case of local origin and only one of imported origin occurred in the last six months of 1916.

The only reasonable explanation apparent of the reduction in the typhoid rate of the county for 1916 is the sanitary measures carried out that year. The county commissioner, usually accompanied by one of the Public Health Service officers, visited all reported cases of typhoid fever and explained and demonstrated to the family the methods of bedside prophylaxis.

The improvement in general sanitary conditions at the homes throughout the county probably was an important factor. About 8,000 persons were inoculated with antityphoid vaccine. This probably was a factor in preventing typhoid, especially at Lindale, where about 60 per cent of the population were inoculated, and in Rome, where about 3,000 were inoculated. A large proportion of those inoculated in Rome was among residents in the unsewered sections of the city who were especially urged by the county commission of health to obtain some degree of protection from the insanitary conditions in their neighborhoods by getting vaccinated against typhoid fever.

CONCLUSION.

With the results accomplished immediately by the survey, with the splendid public sentiment for sanitation prevailing generally among the citizens, and with a whole-time county health officer to direct the work, sanitary progress should continue at a good rate until Floyd County as a whole shall have accomplished a high standard in sanitation.

SANITARY SURVEY OF TUSCALOOSA COUNTY, ALA.

In response to an urgent invitation from the State and county health authorities, rural sanitation studies were extended by the Public Health Service to Tuscaloosa County, Ala., in 1916.

Tuscaloosa, the principal incorporated center and the seat of government of the county, had suffered a severe outbreak of typhoid fever in the autumn of 1915. Upon the students of the University of Alabama, located near Tuscaloosa, the disease had fallen especially heavy—3 of the 17 deaths occurring in the outbreak having been among the university students. It was desired by the officials that all possible be done to prevent a repetition of the typhoid-fever disaster and to safeguard the general health interests of the county. A whole-time county health officer had been appointed, and the situation in the county as a whole appeared particularly favorable for a demonstration in effective sanitation.

The sanitary survey in Tuscaloosa County was begun on March 9, 1916, and terminated on October 30, 1916.

GENERAL CONDITIONS.

Tuscaloosa County, located in the west central part of Alabama, lies between the thirty-third and thirty-fourth parallels of latitude, and between the eighty-seventh and eight-eighth meridians of longitude. It has a land area of 1,246 square miles. The county is generally hilly and is drained by the Black Warrior and Sipsey Rivers, with their tributaries. There are extensive tracts of timberland, and large deposits of coal and iron are found in many sections of the county, especially in the northeastern quadrant. The 1910 census gave a population of 47,559 for the county. There are 450,211 acres in farm land, of which 163,110 in 1910 were improved. Farm values were given as $7,659,502. Farming, lumbering, and the mining of coal and of iron constitute the principal industries of the county. Thus, great natural wealth is found in Tuscaloosa County, and with adequate railroad facilities and the canalization of the Black Warrior River, these products readily reach the market.

Tuscaloosa and Northport are the only incorporated towns in the county. They are located near the center of the county, opposite one another on either bank of the Black Warrior River.

PLAN AND SCOPE OF THE WORK.

Due to the limited force available for the work and the large size of this county, a complete sanitary survey of Tuscaloosa County was not undertaken. The intensive work was at first concentrated in the city of Tuscaloosa and later on was extended to the town of Northport, to two industrial settlements, Kaulton and Brookwood, to the rural dwellings within a zone 3 miles wide around Tuscaloosa, and to two representative country neighborhoods located some distance—one, the Buhl section, 11 miles west, and the other, the Hull section, 12 miles south—from Tuscaloosa City. The Hull and Buhl neighborhoods each comprised an area of about 12 square miles. The number of dwellings surveyed in detail in each of these divisions of the rural section was as follows: One hundred and sixteen in Kaulton, 237 in Brookwood, 155 in the Hull neighborhood, 174 in the Buhl neighborhood, and 681 in the Tuscaloosa 3-mile zone—a total of 1,363.

Besides the survey of homes in the rural sections, studies were made of schools, churches, and other public institutions.

In Tuscaloosa a general sanitary survey, reaching all parts of the city and covering in detail all homes in the unsewered sections, was made. In Northport all dwellings (296) were surveyed in detail.

In addition to the canvass and survey in the sections above mentioned, detailed surveys were made of 10 industrial settlements (mining and lumbering) and reports of findings with suggestions for the needed sanitary improvements made to those in authority.

At the beginning of the survey only one officer of the Public Health Service was detailed to the county. This officer was in immediate charge of the survey, conducted in active cooperation with the county health officer, throughout the period of the studies. Four additional officers of the Public Health Service were detailed to assist in the work for periods as follows: One from July 9 to August 31, one from July 9 to October 30, one from August 7 to September 25, and one from October 10 to October 30.

In the course of the work lectures on sanitation were given from time to time in different neighborhoods. All told 59 public lectures were given, the attendance at these lectures averaging about 68. Thus, besires instructions given to the individual citizens at their homes, about 4,000 of the people of the county heard the facts of sanitation explained at the public lectures.

FINDINGS IN RURAL SECTIONS.

The rural sections surveyed—comprising three country neighborhoods and two industrial settlements—appeared to furnish representative conditions for the county as a whole.

Of the 1,363 dwellings visited in the rural sections, 153 were vacant, and at 111 occupants were not home at the time of the visit, leaving 1,099 homes for which full data were obtained.

Race.—Of these homes the families at 538 (49 per cent) were white, and at 561 (51 per cent) negro.

Nationality.—The heads of all but four of the households were American born, three being German and one Swede.

Ownership of dwelling.—Of the 1,210 occupied dwellings, 280 were occupied by owners, 907 by tenants, and for 23 the ownership was not recorded.

Residence in county.—Of 1,135 dwellings at which the duration of residence of the head of the household in the county was recorded, the duration was less than 1 year for 106, 1 to 5 years for 192, 5 to 10 years for 133, 10 to 20 years for 115, and 20 years or over for 589.

Occupation.—Of the heads of households, 117 were mill hands, 28 were engineers or firemen (of stationary engines), 336 were laborers—farm or other; 40 were artisans, 261 were farmers, 64 were miners, and the remainder were engaged in other occupations of various kinds.

Attitude toward sanitary work.—At only 1, or 0.09 per cent, of the 1,099 homes canvassed did the head of the household appear opposed to the plan and purposes of the sanitary survey. At the remainder the families appeared desirous of cooperating in the studies and of obtaining suggestions about the needed sanitary improvements at their homes.

Number in household.—The number of persons in 1,082 homes at which the number in the household was enumerated was 4,973. Thus the average for each home in the rural sections of the county was 4.6.

Number of rooms to house:	Dwellings.
With 1 room	29
With 2 rooms	315
With 3 rooms	341
With 4 rooms	407
With 5 rooms	138
With 6 rooms	84
With 7 rooms	24
With 8 rooms	10
With 9 rooms	3
With 10 rooms	5
Over 10 rooms	5
Total	1,361
Not stated	2
Total	1,363

Appearance of residence.—On general appearance, 444 of the homes were recorded as good, 820 as fair, and 99 as poor.

Construction of house:	
Frame	1,334
Brick	2
Stone	4
Log	23
	1,363

General cleanliness.—Recorded as good for 293 homes, fair for 922 homes, and poor for 127 homes. For 21 homes this datum was not recorded.

Cellars.—Only 4 of the houses had cellars, 1,359 having none.

Screening in summer.—At 299 homes screening of dining room and kitchen was complete; at 208 homes screening of the dining room and kitchen was partial, serving as a means of excluding probably 50 per cent of the flies seeking admission; and at 856 of the homes there was no screening of dining room or kitchen. Thus 62.80 per cent of the rural homes had no protection from flies whatever, and only about 22 per cent were properly protected in this regard.

Topography.—Seven hundred and eighty-nine of the homes were on rolling ground, 318 were located on level ground, and 256 were on hilly ground.

Water supply.—The water supply of the families canvassed in the rural districts came from the city supply in 72 instances, from the company water works in 145 instances, and in the remainder of instances from private sources, consisting of 534 wells, 65 springs, and 3 cisterns.

Of the 602 homes supplied with water from private sources at 29 there was drainage to the water supply from the stable and at 41 there was drainage to the water supply from the privy. Of the 534 wells 383 were dug, 145 were bored. Six of the bored wells were flowing artesian wells. For six wells the character was not recorded. Two hundred and thirty-nine of the wells were equipped with pumps and 295 with buckets. The water supply in use at 44 per cent of the farm homes was regarded by the investigator as safe.

Disposal of human excreta.—Definite data on the equipment for the collection and disposal of human excreta were obtained for 1,363 homes. Sixteen were found with water-closets connected with private sanitary sewerage systems, and 114 were provided with sanitary privies of fly-proof construction, equipped with water-tight receptacles, kept by systematic cleaning in sanitary condition. Thus 9.54 per cent of the homes in the rural districts surveyed were provided with sanitary toilets at the commencement of the survey. All of the 114 sanitary privies, however, were in one of the industrial settlements (Kaulton), and 8 of the sanitary water-closets were in the other industrial settlement (Brookwood). Therefore, only 8, or 0.79 per cent, of the 1,010, the aggregate number of homes, in the 3 country neighborhoods, were equipped with sanitary toilets.

Three of the privies found were "B" type, having a receptacle to prevent soil pollution, but no screening to keep out flies. Five of the privies were "D" type, with neither receptacle nor screening, but boarded up in the back to prevent the access of barnyard animals to the filth, permitting soil pollution and scattering and tracking of filth by barnyard animals. At 361, or 26.48 per cent, of the homes there was no toilet of any kind, the members of the household using the barn or woods for disposal of excreta.

The distribution of the dwellings at which no toilets were provided was as follows: One hundred and forty-five in the 3-mile zone around Tuscaloosa, 81 in the Hull neighborhood, 64 in the Buhl neighborhood, and 71 in the Brookwood industrial settlement. Thus, of the 1,010 homes in the country neighborhoods, 290, or 28.71 per cent, were not provided with toilets of any kind.

Two hundred and sixty-seven of the privies were cleaned weekly, 246 were cleaned at irregular intervals of more than a month, 359 were never cleaned, scattering of the contents being left to rains and to the scratching of chickens and dissemination by other barnyard animals, and for 101 houses information as to the cleaning of the privy was not recorded.

The disposal of the privy contents was recorded for 615 privies. For 152 the contents were buried by scavenger; for 326 the contents were properly disposed of by householders—by burial, burning, etc.—and for 137 the contents were improperly disposed of by being scattered on the surface of the ground.

State institutions.—The two State institutions in the county, the University of Alabama and the State Hospital for the Insane, are situated on State property, each on its own reservation. The university is located immediately east of the limits of Tuscaloosa and the hospital immediately east of the university.

The university buildings were found to be supplied with water from a deep well and distributed from a standpipe by gravity. The water, being clear at all times, required no filtration. It was treated with hypochlorite of lime and, according to analyses made at the county health department laboratory, it was of good sanitary quality. The university buildings proper and 16 of the other 27 buildings used as residences by the university people were drained by a sewer system emptying into the Black Warrior River. At five of the residences with sewer connections privies for servant use were maintained, and at nine other residences which were not sewerable insanitary privies were used.

At the State hospital the water supply was obtained from an impounded ground water supplied by springs. Analyses of the water showed it to be of questionable sanitary quality. It was found frequently to be turbid and to contain B. Coli in 1 cubic centimeter. The main buildings were drained by a sewer system, and of the 12 miscellaneous buildings two were sewered, and for the remainder 16 insanitary privies were provided. On the hospital farm, situated 3 miles from the hospital, the main building was sewered, the sewage being discharged into a brook, and two homes on the farm were provided with an insanitary privy.

County health administration.—As in the case of all counties in Alabama, the county medical society is the county board of health. In the period of the survey the active health force of the county consisted of a whole-time health officer for the entire county, appointed on January 1, 1914, and a whole-time assistant health officer, appointed in March, 1916. The former was a graduate in medicine, and the latter a graduate sanitary engineer. Two nurses were under the direction of the health officer, one, a school nurse, employed by the board of education of the city during the school term only, and one, employed by the antituberculosis league when their funds permitted, a district visiting nurse.

When active measures were undertaken to sanitate Tuscaloosa, a city sanitary inspector was appointed who devoted his whole time to the details of sanitation.

A bacteriological laboratory was maintained by the county for usual examinations and analyses incident to the proper administration of public health.

During the time of the studies the county health officer, the assistant county health officer, and the sanitary inspector of Tuscaloosa were actively engaged in the work. All duties of an engineering nature were performed by the assistant health officer.

FINDINGS IN TOWNS.

In the survey of the city of Tuscaloosa and the town of Northport attention was directed especially to refuse disposal, water supplies, and food supplies.

Tuscaloosa.—Tuscaloosa was found to be in many respects a progressive little city. It was well paved and well lighted, and was governed by a board of three commissioners. The city had a population of 9,000 in 1910, and an estimated population of 14,500 in 1916. The number of dwellings was about 3,000.

The public water supply for the town was obtained from the Black Warrior River, upstream from the sewer outfalls from the city. The water was heavily polluted, however, by sewage from Birmingham, from Bessemer, and from a number of smaller settlements along the river and its tributaries. This water was treated with alum, settled, filtered by the rapid filtration method, treated with hypochlorite of lime, and delivered from a standpipe by gravity. Weekly analyses of the water were made at the laboratory of the county health department. During the period of the survey B. Coli were never found in 10 cubic centimeters, and the total count rarely exceeded 60 per cubic centimeter, and frequently was as low as 15 or 20. Owing to pollution with mine water and with waste from smelter and other plants there was at times an objectionable taste to the water. At one time of low flow fish in the river were killed by th contaminating substances in the water. The public water supply was ample, and three-fourths of the homes in the city were supplied from the city reservoir. The water supply for homes not connected with the city service was generally from shallow dug wells, poorly protected from surface pollution.

The sewerage system of the city discharged into the Black Warrior River. About two-third of the homes in the city were connected with the sewer. Several homes within the sewered area had not been connected. Extensions were made to the sewer system from time to time.

On the first round of survey it was found that about 1,000 insanitary, open-back, ground-polluting privies existed in Tuscaloosa. A scavenger system for the cleaning of privies was maintained by the municipality. The scavenger service was rendered about once a week, at a cost of $3 per home per year, if paid quarterly in advance, or $4 if collected after the lapse of the time allowed for payments in advance. The privy contents were collected in large cans by the scavenger and emptied into a concrete trough built over a manhole of the sewer.

The typhoid fever history of Tuscaloosa for 1915 was: Cases (estimated), 175; deaths, 17. Three of those who died were students at the State university.

At the beginning of the survey a strong sentiment was found among the citizens for such work as might be necessary to prevent a repetition of the 1915 outbreak. A study of the records and inquiries about town disclosed the fact, however, that the typhoid fever record for 1915 was not above the average for the previous three or four years. Because the disease in 1915 had fallen so heavily upon the students at the university was the disease and death incident so prominently brought forward.

Northport.—At the time of the survey Northport had 296 dwellings. Of these 30 were vacant, and at 11 more there was, at the time of the visit, no one at home, leaving 255 homes at which full data were obtained.

One hundred and forty-three homes were occupied by their owners and 112 homes were occupied by tenants. One hundred and twenty families were white and 135 colored. In the 255 homes there lived 1,122 persons, giving an average of 4.4 persons to the home.

One hundred and three homes were completely screened against flies, 33 homes had partial screening, and 160 homes had no screens.

Sixty-one families obtained water for domestic purposes from the town (piped) supply, 140 families were supplied by wells, 3 families were supplied by springs, and for 51 families the source of water used principally was not recorded. The public (piped) supply was obtained from a free-flowing spring at the foot of a hill in the town. This spring was well protected by cement work from surface contamination. It appeared from field observation to be exposed to subsurface pollution, but on bacteriological examination the water was found to be free from B. coli in quantities of 10 cubic centimeters, and its total bacterial content seldom to exceed 100. The private wells generally were shallow dug wells equipped with buckets. Practically all of the private wells and the three private springs were obviously exposed to pollution from near-by insanitary privies.

A sewer running along the main street of the town had connected with it a number of stores and 49 dwellings. At each of 45 of the 49 dwellings connected with the sewer there was in use, in addition to the water-closet in the house, an insanitary privy in the yard. At 225 dwellings not connected with the sewer insanitary privies were found. Twenty-two dwellings were provided with neither water-closet nor privy. Thus, there were found in this town 270 insanitary privies at 270 dwellings, and 22 dwellings without toilets—leaving, of the total of 296 houses, only 4 at which sanitary disposal of human excreta was accomplished.

TYPHOID FEVER PREVALENCE.

Among 4,973 persons enumerated in the rural sections, 506, or 10.18 per cent, gave a history of having had typhoid fever, and of this number 56 were recorded as having the disease in 1915.

Among 1,122 persons enumerated in Northport, 153, or 13.64 per cent, gave a history of having had typhoid fever, and of this number 11 were recorded as having had the disease in 1915.

In Tuscaloosa 17 deaths from typhoid fever were reported in 1915, giving the city for that year a typhoid fever death rate of about 121 per 100,000 of population.

Judging by these figures it appeared that the typhoid rate of prevalence in Tuscaloosa County as a whole had been high in 1915 and also in the previous years of the generation.

GENERAL MORBIDITY.

Of 6,095 persons canvassed in the homes in the three country neighborhoods, the two industrial settlements and Northport, 112, or 1.83 per cent, were recorded as definitely ill at the time of the visit to the homes. Of the persons sick, 50 were male and 62 female; 11 were under 5 years of age; 9 were from 5 to 10 years old; 9 were from 10 to 15; 4 from 15 to 20; 39 from 20 to 40; 31 from 40 to 60; and 9 were 60 years old or over.

With the exception of those in the Kaulton settlement, all of the homes in this group were in communities in which grossly insanitary conditions in respect to the disposal of human excreta obtained. In Kaulton at the time of the survey all dwellings were provided with well-constructed, well used and cared for, and well-scavenged sanitary privies. The morbidity in this community presented a striking contrast to that of the other communities. In Kaulton, with a population of 451, only 2 persons were recorded as ill at the time of the visit to the homes. Thus, the morbidity in Kaulton, with good sanitary conditions, was 0.43 per cent, which was less than one-fourth of the morbidity found in the settlements with poor sanitary conditions.

The following table gives the number of cases of illness from different causes recorded as occurring in the calendar year 1915 among the 6,095 persons in the rural communities (including Northport) canvassed:

Nature of illness.	Number of cases.	Nature of illness.	Number of cases.
Asthma	3	Indigestion	7
Appoplexy	2	Malaria	159
Appendicitis	5	Mumps	34
Biliousness	5	Measles	7
Brain injury	1	Misery in side	1
Bad heart	1	Misery in back	1
Blood trouble	1	Misery in stomach	1
Croup	1	Neuralgia	1
Chicken pox	7	Old age	2
Conjunctivitis	5	Ovarian trouble	1
Congestion of stomach	1	Pneumonia	18
Colds of stomach	9	Pellagra	14
Colitis and flux	20	Pleurisy	1
Diphtheria	8	Rheumatism	7
Dysentery	26	Run down system	1
Dropsy	3	Stomach trouble	2
Diarrhea	4	Summer complaint	1
Erysipelas	1	Smallpox	1
Female trouble	11	Typhoid fever	61
Floating kidney	1	Tumor	5
Fever (z)	1	Tuberculosis	7
Gonorrhea	1	Tonsilitis	4
Gunshot wound	1	Weak stomach	1
Grippe	31	Whooping cough	15
Heart trouble	5	Unknown	6
Head trouble	1		
Infantile paralysis	1	Total	514

This return would give a morbidity rate for the year of about 91 per 1,000, which is too low to be reasonable, and indicates that records of morbidity for a previous year obtainable by house-to-house canvass, though throwing light on the relative rates of prevalence of different diseases, can be expected to show less than the actual morbidity.

SANITARY MEASURES RECOMMENDED.

The measures especially recommended for the farm homes were (1) sanitary disposal of human excreta, (2) protection of water supplies from potentially dangerous contamination, (3) protection of foods from invasion by flies, and

(4) the prompt institution of rigid cleanliness at the bedside of cases recognized as or suspected to be typhoid fever or other infectious disease. At the homes of persons in reduced financial circumstances, and especially at the homes of tenants, the advantages of the Mosaic method of excreta disposal were emphasized.

For the mining and lumbering camps, not provided with sewerage systems, the immediate installation of a sanitary privy system with adequate scavenger service was recommended. For these settlements the importance of safeguarding of water supplies and screening of dwellings to exclude flies and mosquitoes was also stressed.

Tuscaloosa.—By April 11 the general survey of the city had been completed, the needs of the situation had been defined and public sentiment had become crystallized, through the publicity given the work, for concrete sanitary improvements. On that date, the officer in general charge of the rural sanitation studies of the Public Health Service visited Tuscaloosa and, after conference with the officer in immediate charge of the survey in the county, and with the county health officer, went before the city commissioners and submitted specific recommendations for effecting the needed sanitary improvements.

Extension of the public water supply and sewerage systems as rapidly as practicable was recommended.

The specific measures recommended to be carried out with the greatest dispatch possible to accomplish a sanitary disposal of human excreta were as follows:

1. That the city ordinance requiring all places of human abode accessible to a public sewer to be connected therewith be rigidly enforced.

2. That an ordinance be enacted embodying the following provisions: (1) It shall be unlawful for any person to dispose of human excreta (stools or urine) within the incorporated limits of Tuscaloosa, Ala., in an insanitary manner—said excreta to be disposed of either in a sanitary water closet properly connected with a sanitary sewer, or in a sanitary privy; (2) all privies shall be provided with suitable (metal) water-tight receptacles for the catchment of the excreta and shall be so constructed (*a*) that flies can not gain access to the contents of the receptacles, and (*b*) so that the receptacles will be readily accessible for removal and cleaning by the city scavenger; (3) that said receptacles shall be furnished by the municipality.

3. That the reconstruction of existing privies and the construction of new privies be done at the expense of the property owners, and in accordance with specifications to be furnished by the city health officer.

4. That once each week the contents of all privies be removed and disposed of in an inoffensive and proper sanitary manner by the public scavenger.

5. That a sanitary inspector be detailed or appointed to serve under the direction of the city health officer in the proper enforcement of the sanitary ordinances of the city of Tuscaloosa.

The commissioners formally approved these recommendations and, on April 14, adopted an ordinance (Sanitary Ordinance No. 311) embracing them.

Northport.—On April 15 the officer in immediate charge of the county survey appeared before the town council of Northport and submitted to that body specific recommendations for needed local sanitary improvements. His recommendations included the installation of a plant for the treatment of the public water supply with hydrochlorite of lime, and otherwise were similar to those made for Tuscaloosa. A few days after this the town council adopted an ordinance relative to the disposal of human excreta which was practically identical with the Tuscaloosa ordinance.

Public institutions.—For the State university and the State hospital the abolishment of insanitary privies with the installation in their stead of either sanitary privies or properly connected water closets was recommended. At the State hospital an improvement in the water supply also was recommended. The measures advised at both these institutions were promptly ordered by the respective authorities.

A recommendation for the sanitation of the dwellings of the keepers of the locks on the Black Warrior River was submitted, through the Bureau of the Public Health Service, to the Engineering Corps of the United States Army.

COOPERATION.

Hearty cooperation in the work was received from the county officials, the commissioners of Tuscaloosa, the council of Northport, the majority of the owners of industrial establishments, the local clergymen and practicing physicians, commercial and civic organizations, the local newspapers, and many individual citizens of prominence and influence.

All of the work was done in active cooperation with the county health officer and the assistant county health officer. Their efforts were untiring, enthusiastic, intelligent, and effective.

The commissioners of the county gave the work their strongest possible support. The probate judge of the county, who is one of the ablest public speakers in Alabama, was an earnest, enthusiastic, and very effective supporter of the program of sanitation recommended. He never hesitated when occasion offered to sacrifice his personal business interests to take part in the health work. He accompanied the health officers to a large proportion of the public meetings, and from the standpoint of a citizen of the county, drove home to his people the facts of sanitation.

The pastors of the churches in the county actively supported the propaganda—many of them preaching sermons with "Sanitation" as the theme.

The practicing physicians gave the work their strong support. They reported promptly, it appeared, all cases of infectious disease, and, as a rule, at the homes of the patients gave detailed instructions about bedside measures to prevent the spread of infection. The cooperation of the physicians made it possible for the health officers to visit promptly cases of typhoid fever to assist in getting carried out the bedside precautions and other sanitary measures needed.

The local newspapers gave the work excellent publicity and strongly supported the program. In so doing they contributed much to the development of public sentiment for sanitation.

The business men's organization in Tuscaloosa gave the work strong support, and was very effective in overcoming objections raised by property owners to spending a reasonable amount of money for the necessary sanitary improvements on their properties.

As a fitting climax of the splendid response of the citizens generally to the suggestions for sanitary improvements, an exhibit was arranged, through the cooperation of the West Alabama Fair Association, in one of the booths at the big fair held in Tuscaloosa October 23–28. This booth, appropriately decorated, contained charts and models and also literature for distribution. Hundreds of persons attending the fair visited the booth, had the models demonstrated to them, and received instructions in home sanitation.

RESULTS.

To determine the degree of sanitary improvements accomplished subsequent to the first visit of survey, 1,154 dwellings in the rural section—comprising the three country neighborhoods and the two industrial settlements—and all of the dwellings in Tuscaloosa and in Northport were revisited.

Country homes.—At 682, or 59.09 per cent, of the 1,154 homes revisited in the rural section, high-grade sanitary privies with water-tight receptacles and of fly-proof construction had been installed in the place either of grossly insanitary privies or of no toilets. In addition, there were found among these homes 37 homes at which the family had adopted and, so far as could be ascertained by careful investigation, was consistently practicing the Mosaic method of excreta disposal. On the first round of survey of the rural section, 130 of the homes were found to be provided with sanitary toilets. Adding these to the number of sanitary privies installed and to the number at which direct sanitary disposal was effected, gives a total with known sanitary disposal of 849, or 62.29 per cent, of the total homes (1,363) originally surveyed in the rural section.

In the rural section the big percentage increase in sanitation was found in the 3-mile-wide zone around Tuscaloosa. The result in this zone demonstrated what may be accomplished in sanitary progress in strictly rural neighborhoods under adequate governmental control. By midsummer radical sanitary improvements had been effected voluntarily by the property owners at a large proportion of the farm homes in the 3-mile zone; but it was realized that progress in the zone was not being made at a sufficient rate to give the community—including the city of Tuscaloosa—full protection against filth-borne infections. It was then discovered that under the general acts of the State of Alabama the municipal authorities of Tuscaloosa had sanitary jurisdiction over a zone 3 miles around the city. The paragraph (1230) of these acts giving the authority is as follows:

> 1230. *Police jurisdiction; territorial.*—The police jurisdiction in cities having six thousand or more inhabitants shall cover all adjoining territory within three miles of the corporate limits, and in cities having less than six thousand inhabitants, and in towns, such police jurisdiction shall extend also to the adjoining territory within a mile and a half of the corporate limits of such city or town. * * * Ordinances of a city or town enforcing police or sanitary regulations and prescribing fines and penalties for violations thereof shall have force and effect in the limits of the city or town and in the police jurisdiction thereof, and on any property or right of way belonging to the city or town.

On August 28, the county commissioners expressed their desire to have this law enforced and appropriated $200 per annum to cover the increased cost from the longer hauls and so to enable the scavenger service of the city to be extended to the dwellings in the zone. On August 29, the commissioners of the city of Tuscaloosa declared the ordinance (No. 311), adopted for the city, in force and effect in the area within a radius of 3 miles from the outer corporate limits of the city. Following this action the rate of sanitary work in the zone was markedly increased. By October 30, at all of the 681 dwelling houses in the 3-mile zone, except 75, sanitary privies had been installed and the work was still in progress with a good outlook for completion within two or three weeks. Of the 75 dwelling houses not provided with sanitary toilets, 55 were unoccupied, leaving in this extensive rural area only 20 families which were not provided with well constructed and well kept sanitary toilets.

Industrial settlements.—Of the 12 industrial settlements in the county which were covered in detail or in general by the survey, sanitary improvements—including the installation of a sanitary privy system—had been completed at 6, were ordered by the property owners and were underway at 5, and were ordered by the property owners, but not underway at 1.

University of Alabama.—Promptly upon receiving the suggestions the authorities of the University had all privies at sewered homes abolished and had 9 sanitary privy boxes installed at the 9 dwellings on the reservation which were not sewerable.

State Hospital for the Insane.—The insanitary conditions at the State hospital were called to the attention of the superintendent, and immediate steps were taken to correct them. At the close of the survey all privies had been converted into the approved plan adopted by Tuscaloosa. A septic tank had been built to intercept the sewage from one of the homes with plumbing, but not connected with the sewer, and a larger septic tank was in process of construction at the main building on the hospital farm to intercept the sewage from that building. To correct the dangers from a polluted water supply a deep well was being bored for domestic use at the hospital.

United States Government dwellings.—In accordance with the recommendations made the Engineering Corps of the United States Army had sanitary privies installed for the families of keepers of locks on the Black Warrior River not only in Tuscaloosa County but along the whole course of the river in Alabama.

Tuscaloosa City.—The ordinance requiring sanitary disposal of all human excreta within the incorporated limits of the city became effective May 15, 1916, and under its terms the work was carried forward vigorously, and in a very businesslike manner. Five thousand additional feet of sewer were laid. One hundred and twenty-six dwellings at which insanitary privies had previously been in use were equipped with sanitary water-closets and connected with the new sewer. The 126 insanitary privies at these homes were cleaned, disinfected, and abolished.

The work of installing sanitary privies was practically completed by June 1. On a resurvey of the city in the last few days of October it was found that at every home which could not be connected with the sewer system a sanitary privy had been installed, and that all unused privies had been removed. By actual count there were in the city of Tuscaloosa 1,032 well-constructed and well-kept sanitary privies. Only 2 of the (approximately) 3,000 dwellings were found to be without equipment for sanitary disposal of human excreta. Both of these dwellings were within the sewered area. With these two exceptions no premises in the city presented evidence of insanitary deposit of human excreta. To complete the work court proceedings were inaugurated against the owners of the two properties not complying with the terms of the ordinance. This action resulted in compliance with the ordinance before the cases came to trial, and at these two dwellings—making a last stand for filth—the work of installing water-closets connected with the sewer to take the place of the two insanitary privies was begun.

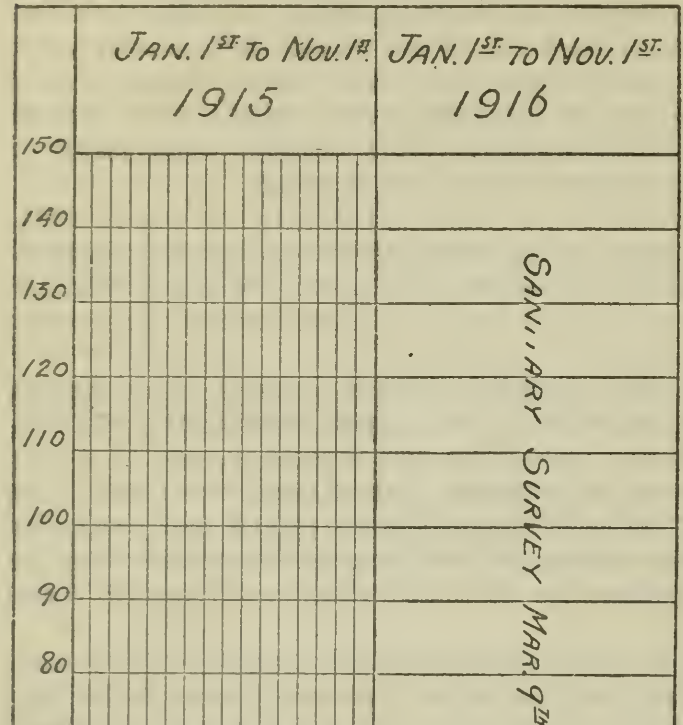
On December 9, 1916, a telegram from the chairman of the city commission stated that the work on the two premises had been completed.

Thus Tuscaloosa gained a rating of practically 100 per cent in sanitary disposal of human excreta.

A number of the details of installing and operating a sanitary privy system—as described in Public Health Bulletin No. 89—were accurately determined from careful and practical studies made of the problem in the course of the work in Tuscaloosa.

The scavenger service was operated by the municipality. It was under the general control of the county health officer, and under the immediate supervision of the newly-appointed sanitary inspector for the city. A shed was built over the concrete disposal trough used in the old scavenger methods, and platforms for use in loading and unloading were constructed. Two wagons were built, with flat beds, each of a size to carry 40 of the privy cans. These cans were the property of the city, supplied to the privies and kept in repair by the city. They were of a uniform size, 15 by 15 inches. The scavenger wagons were continuously in service. Each privy was visited every five and one-half days. A clean can with top was taken to the privy, the used can removed, the top placed on it, the clean can placed in the privy box, and the used can placed on the wagon. When 40 privies had been thus visited, the wagon went to the disposal grounds, unloaded the used cans and reloaded with clean cans, and started a second trip. At the disposal vat the cans were emptied, washed, and scrubbed as required, a pint of disinfecting solution was placed in the can, and the top put on ready for another trip. Each wagon made an average of four trips a day to the disposal vat. At the disposal vats the contents of the cans were washed down the sewer (figs. 55–58).

CHART 15:- TYPHOID FEVER REDUCTION FOLLOWING SANITARY SURVEY IN TUSCALOOSA, ALA.



* 6 CASES KNOWN TO HAVE CONTRACTED THE DISEASE OUTSIDE OF TUSCALOOSA. IN 1916.

Northport.—At the termination of the survey the town council had taken no action on the recommendation to install a hypochlorite plant for the treatment of the public water supply, but good progress has been made in the sanitary disposal of human excreta. One hundred and eighty-five sanitary privies and 24 additional sewer connections had been installed in the place of grossly insanitary privies found at these 209 homes on the first round of survey. Of all the occupied dwellings in the town, only eight were found on the final round of survey in the last few days of October not to be provided with either a sanitary privy or a sanitary water-closet. The sanitary work in Northport was conducted along the same general lines, but not with the same rapidity, as that in Tuscaloosa.

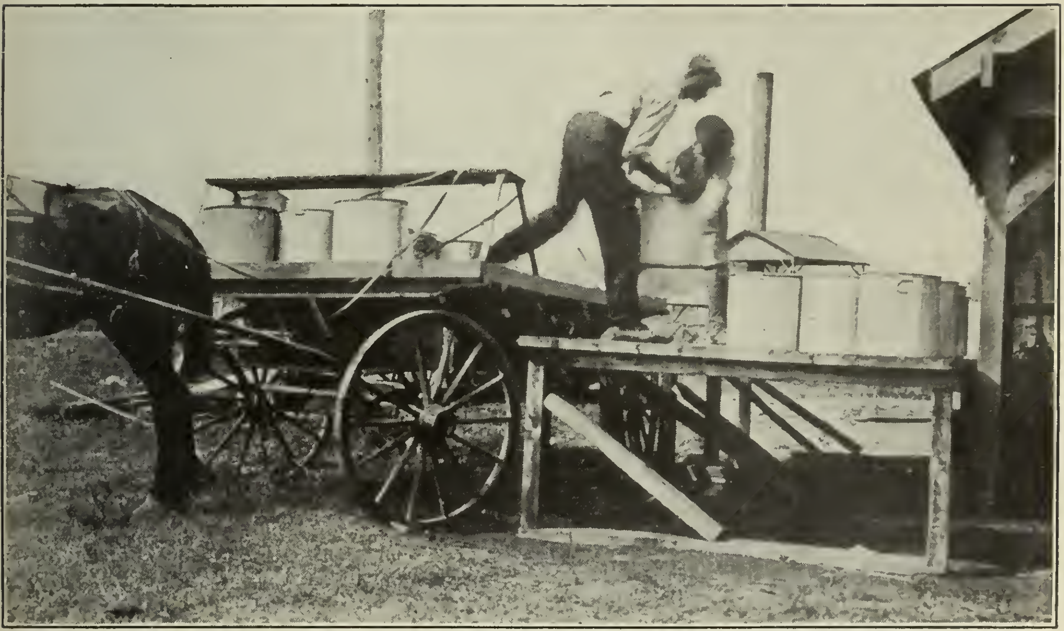


Fig. 55.—Delivering privy contents at disposal station.

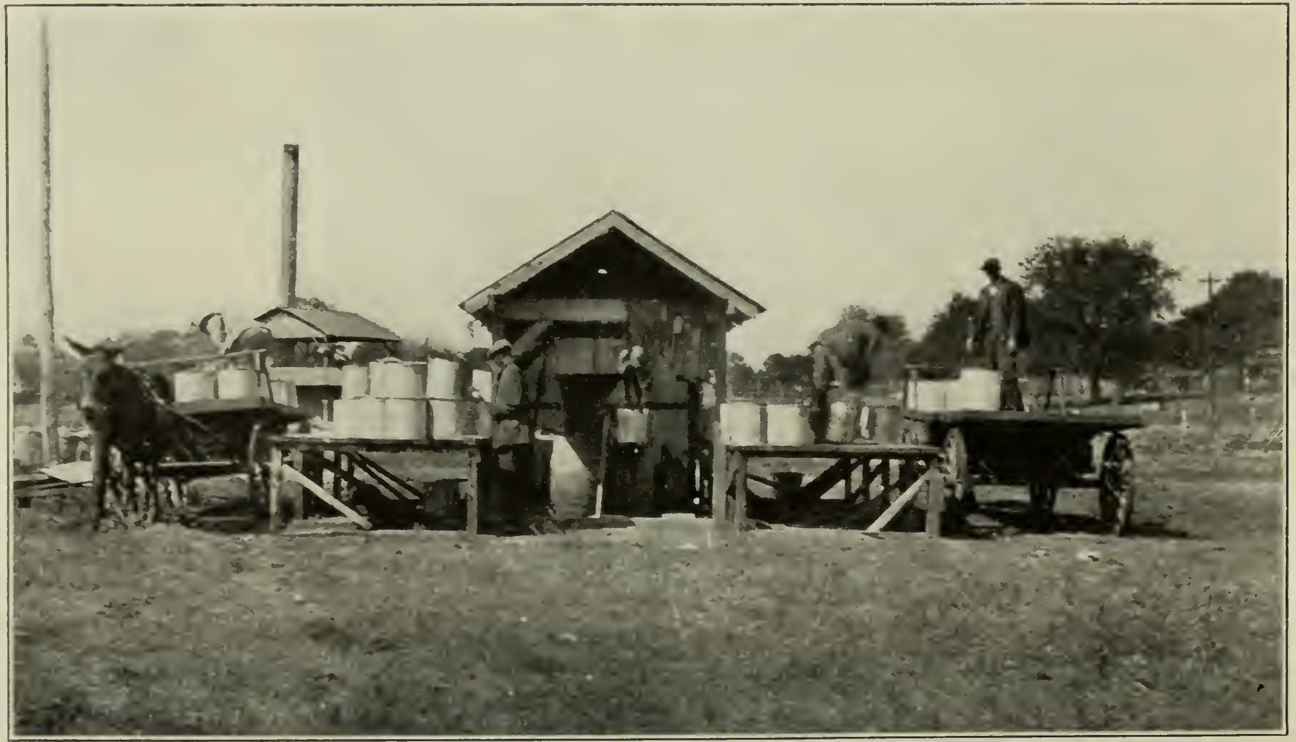


Fig. 56.—Delivering filled cans for disposal of contents and loading with cleaned cans for replacement in privies. Tuscaloosa County, Ala.

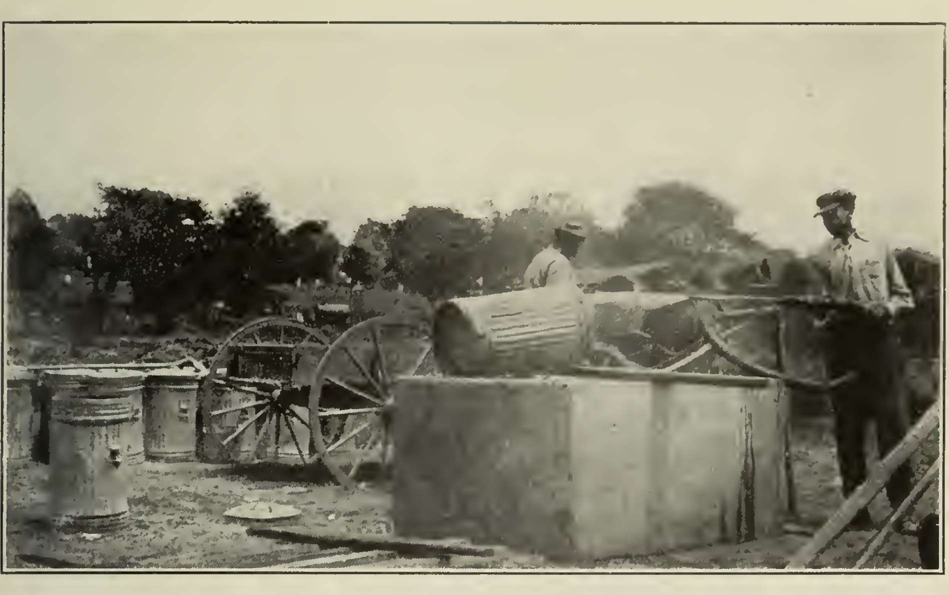


Fig. 57.—Emptying privy contents into sewer, Tuscaloosa County, Ala.

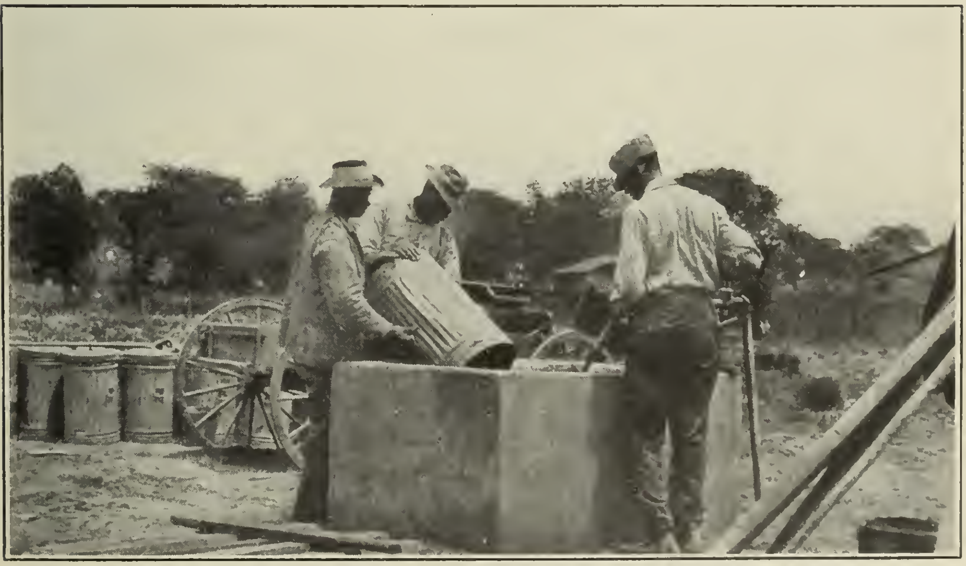
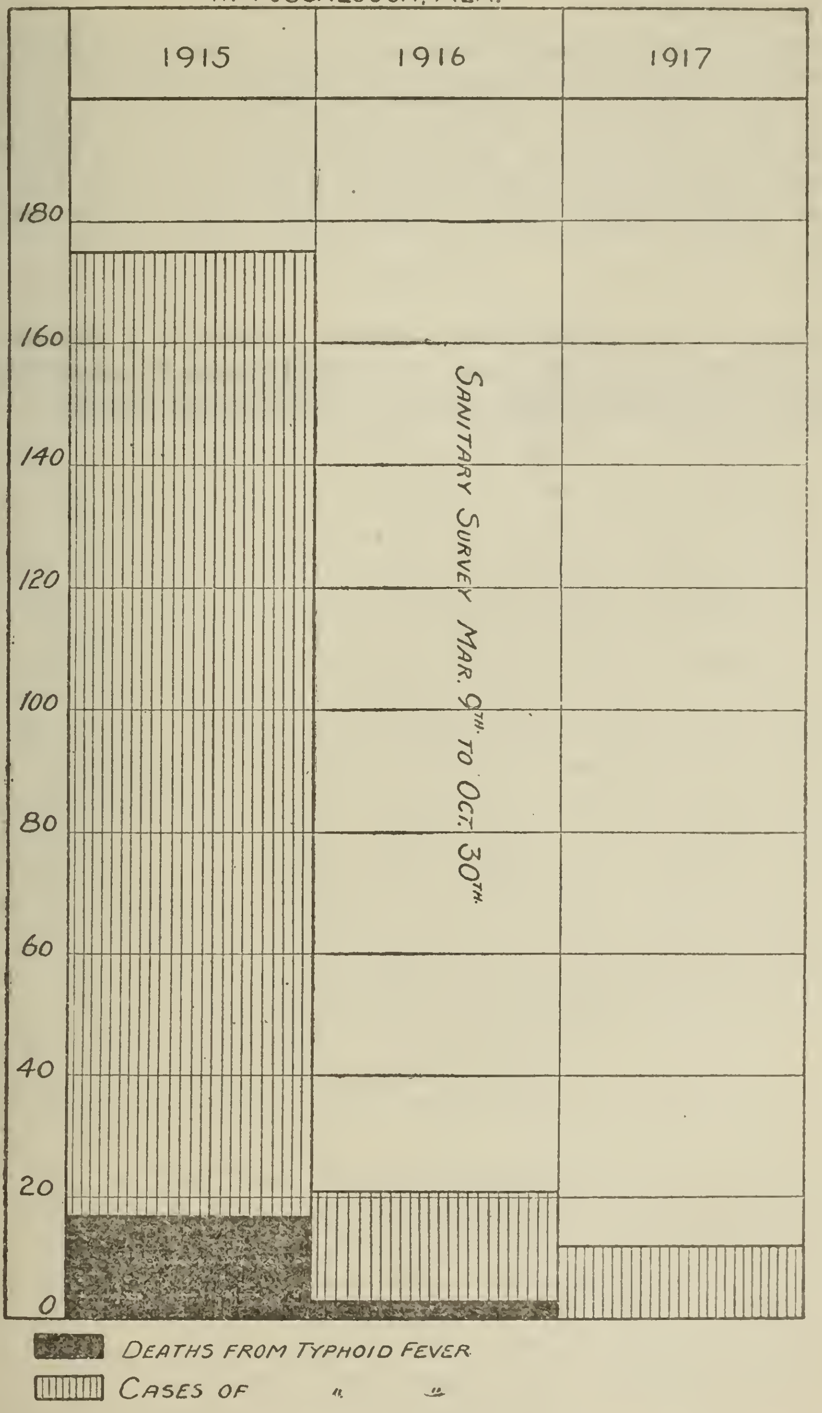


Fig. 58.—Cleaning cans, Tuscaloosa County, Ala.

Typhoid-fever reduction.—The sanitary improvements accomplished appeared have a marked effect upon the typhoid-fever rate in both the rural sections urveyed and the city of Tuscaloosa. In the rural sections the number of ases of typhoid fever reported in 1916 was 29, as against 56 cases recorded n the same area in 1915.

CHART 16: TYPHOID FEVER CASES AND DEATHS RECORDED IN TUSCALOOSA, ALA.



In Tuscaloosa city the typhoid-fever record for the period January 1 to ovember 1 of 1916 was 11 cases with no deaths. Of the 11 cases reported n this period 6 were found on investigation to be in persons who had contracted the infection while away from the city. In the calendar year 1916, the ear of the survey, there were reported in Tuscaloosa 21 cases of typhoid fever, with 3 deaths, as against 175 cases (estimated), with 17 deaths, in the calendar year 1915. In 1917 only 12 cases, without a single death from typhoid fever, were reported in the city of Tuscaloosa, and of these 12 cases 3 originated outside the city (charts 15 and 16).

Extra county effects.—The State Board of Health of Alabama issued a bulletin in which the Tuscaloosa ordinance was presented as a model sanitary ordinance for towns and cities, and the Tuscaloosa type of sanitary privy was presented as a standard.

In the course of the survey delegations from a number of neighboring towns and cities visited Tuscaloosa to observe the sanitary methods. As a result of the visit by the delegation from Selma, Ala., work was begun on the Tuscaloosa plan to install in that town a sanitary privy system. Some months later it was officially reported that 1,300 insanitary privies in Selma had been converted into sanitary type and that the sanitary privy system was proving satisfactory.

CONCLUSION.

The sanitary survey in Tuscaloosa County resulted in a demonstration of both rural and urban sanitation and of the effectiveness of reasonable sanitary improvements in reducing diseases caused by filth-borne infection.

SANITARY SURVEY OF OBION COUNTY, TENN.

In the early spring of 1916 requests for a sanitary survey of Obion County, Tenn., transmitted through and strongly indorsed by the State board of health, were received from the county and town authorities, the school boards, the county medical society, local civic organizations, and a number of prominent individual local citizens. As it appeared to be fairly representative of the rural counties in the western half of Tennessee, and as its typhoid-fever rate had been high, this county was included among those for the sanitary survey.

The survey of Obion County was begun on April 12, 1916, and was terminated on November 3, 1916.

GENERAL CONDITIONS.

Obion County lies between the thirty-sixth and thirty-seventh parallels of latitude, and between the eighty-ninth and ninetieth meridians of longitude. It is situated in the northwest corner of the State of Tennessee, and is bounded on the north by the State of Kentucky, on the west by Reelfoot Lake, on the south by Dyer and Gibson Counties, and on the east by Weakley County. It is separated from the Mississippi River on the west only by Reelfoot Lake and Lake County. Lake County is a narrow strip of land between the lake and the river. Topographically there are in Obion County three distinct divisions. In the western portion for a distance of about 6 miles eastward from the lake there is a strip extending from north to south, which is occupied by steep hills and deep ravines. From the northeast corner to the south central portion the county is traversed by Obion River, which is bordered by a vast swampy area of about 3 miles width on each side. In this section malaria is highly prevalent. The remainder of the county, comprising the central portion and representing about half of the entire area, may be described as gently rolling. The soil formation is alluvial, uniformly a loam and clay combination. No limestone is encountered except at a depth of 75 feet or more. The geological age of this section is that of its rise from the bed of the Mississippi, or about Tertiary. No deposits of ores or minerals are found, but prospecting is going on in the region of Reelfoot Lake for oil, which has been found, but not, up to the present, in sufficient amount to be of commercial interest.

The county is distinctly rural, having only one town with a population over 2,500.

According to the census reports, the population of the county in 1910 was 29,946, of which 82.3 per cent were white and 17.7 per cent negro. The percentage increase in the population in the decade 1900–1910 was 5.9, and in the decade 1890–1900, 3.7. The land area is 552 square miles. The population per square mile was 54.3 for the whole county and 46.3 for the rural section. The urban population, all comprised in that of Union City, was 4,389. Only 0.1 per cent of the population was foreign born. Among persons 10 years old or over the percentage given as illiterate was 8.5.

The number of farms was 3,807, of which 2,047 were operated by owners and the remainder by tenants; 87.1 per cent of the land area was in farms, 70.4 per cent being improved. The average number of acres per farm was 80.8, with 56.9 acres improved. The average value of farm land per acre was given as $35.51. The estimated value of all farm crops in 1910 was $3.089,838, of which the value of cereals amounted to $2,137,614. Corn was the principal crop, about 3.000.000 bushels being produced.

When properly cultivated the soil yields bountifully. The industry of the county is almost wholly agricultural. It is necessary to use commercial fertilizer in but few, if any, cases. Staple farm products are corn, hay, cotton, and live stock. In the lake region a considerable number of people derive their livelihood from fishing, which is followed at all seasons. Manufacturing gives employment to a few score of people in Union City, which has two waterproof-coat factories, a canning establishment, and a garment factory. The mill village problem, however, does not exist in this county. Of considerable sanitary importance are the several strawberry fields, there being one near Union City and one near Obion, of about 100 acres each. During the strawberry season from 500 to 1,000 persons are employed in each of these fields. The berries are marketed in St. Louis, Chicago, and the large cities of the East.

The climate is that characteristic of the central Mississippi Basin. The maximum summer heat rarely gets above 98, and the minimum during the winter rarely less than zero. The average relative humidity is about 78.

Regarding the general vegetation of this section, nothing of importance is to be noted, except the abundant growth of different varieties of ragweed and golden rod. In connection with this first it is interesting to note that a history of hay-fever attacks was met with in but a very few instance.

There are seven incorporated towns in this county with populations (in 1910) as follows: Union City, 4,389; South Fulton, 1,391; Obion, 1,293; Troy, 529; Rives, 468; Kenton, 374; and Samburg, 111.

The county has good railway facilities. The public (wagon) roads are unimproved and for the greater part of the year in bad condition. An election in 1916 on a bond issue for improving the county roads failed to carry by a large majority. Thus, in that year it appeared that the citizens of Obion County had not become awakened to the advantages of good roads.

PLAN AND SCOPE OF SANITARY SURVEY.

The work comprised (1) a canvass and a sanitary survey of all homes in the county, including rural and town, (2) a general sanitary survey of the seven incorporated towns, (3) a sanitary survey of the schoolhouses, churches, and stores, (4) public addresses on the subject of sanitation, with lantern-slide illustrations, in all sections of the county, (5) distribution of literature on the different phases of the subject of sanitation, and (6) the epidemiologic investigation of cases of typhoid fever as they developed.

In the first few days of the survey the work was given good publicity through the local newspapers and through three largely attended public meetings held, one at Union City, one at Obion, and one at Troy. These introductory public meetings were addressed by the statistician of the State board of health and by the officer of the Public Health Service in general charge of rural sanitation studies.

Somewhat more than a third of the homes in Obion County are located in towns, varing in size from about 200 to about 5,000 inhabitants. In the towns the work followed somewhat different lines from that among the rural homes. In the latter a personal appeal was the last resort, but in the towns, where organized local government was in action, the principal effort for sanitary reform was made through the town council by securing their adoption and enforcement of sanitary ordinances. In every town a house-to-house canvass and survey was made of all homes. From cards thus obtained a tabulation of the data relating to the water supply, the waste disposal, and the typhoid-fever history was made and incorporated into a formal report for presentation at once to the town council. Immediately following this report a sanitary ordinance designed to suit the particular conditions in each case was presented to the council for adoption.

The county was divided into districts for convenience in making the survey, the boundaries for the districts being railroads, streams, or county roads, which were arbitrarily selected and which formed readily recognizable boundaries. For transportation in visiting the rural homes the men used automobiles.

Endeavor was made in the visits to the homes to ascertain by careful questioning the history of each family in respect to the incidence of disease in general and of typhoid fever in particular. The survey of the premises was made usually in company with some member of the household, the head of the household whenever practicable. Attention was directed especially to human-excreta disposal, stable-manure disposal, water supplies, and the protection of foods from invasion by flies. Literature on excreta disposal, water supplies, typhoid fever, and other appropriate subjects was freely distributed.

Public lectures on sanitation were given from time to time in different neighborhoods. These were usually illustrated with stereoptican slides. In the course of the work 80 public lectures were given. The attendance at the lectures averaged about 145. Thus, besides instructions given to the individual citizens at the homes, 11,658 of the people of the county heard the facts of sanitation explained at public lectures.

Headquarters were established in the post office at Union City. Circular letters were sent to the families throughout the rural districts explaining the plan and object of the work. Upon request, bulletins on sanitary subjects were sent by mail to the citizens.

The force engaged in the detailed survey consisted of officers of the Public Health Service. The State board of health, on account of its state of finances, was unable to furnish anyone for the working force.

The progress of the work during the first round of visits to the homes, which was completed July 31, is shown in the following table:

Week of survey.	Number of homes.	Churches, schools, etc.	Meetings.	Attendance.	Men at field work.	Days worked.	Cards per day[1] (average per man).
1	270	6	8	1,600	5	24	11.5
2	297	14	.....	.....	5	28½	10.9
3	358	11	5	1,020	5	24	15.4
4	343	9	13	2,677	5	27	13.0
5	360	14	11	755	5	28	13.3
6	486	6	8	970	5	30	16.4
7	444	12	3	175	5	27	16.9
8	205	8	2	175	5	19	11.2
9	590	15	7	845	6	30	20.0
10	408	22	3	130	6	22	19.5
11	480	21	3	235	6	36	13.9
12	300	12	4	1,150	9	26	12.0
13	526	22	3	465	9	38	14.4
14	338	9	9	996	6	32	10.9
15	597	8	4	465	6	30	20.0
Total	6,002	189	80	11,658	.....	425½	.....

[1] The average cards per man per day for the whole period was 15.77.

After July 31 the time of the men was devoted to follow-up visits to town and country homes and to supervising sanitary measures being carried out in the towns. The following table shows the progress of the follow-up visits to the country homes:

Follow-up survey.

[Began July 31, 1916.]

Week of survey.	Cards.	Meetings.	Attendance.	Men in field.	Days canvassing.	Days special detail.	Cards per man per day.[1]
1	165	1	75	6	16	8	10.4
2	107	1	100	5	13	14	8.2
3	123	1	50	4	17	7	7.2
4	262	3	95	4	19	5	13.8
5	209	2	35	4	12	2	17.4
6	175	4	550	5	15	18	11.7
7	151	2	110	5	8	16	19.0
8	98	6	320	3	8	10	12.2
9	202	4	70	4	14	3	14.4
10	127	3	260	3	10	6	12.7
11	258	....	....	3	15	3	17.2
12	102	1	20	3	9	7	11.3
13	26	....	....	2	5	7	5.2
14	....	....	....	....	....	4	....
Total	2,005	28	1,685		161	110	....

[1] Average cards per man per day for the period of the follow-up survey was 11.8.

The number of rural dwellings covered by the survey was 3,918 and the number of town dwellings 2,084.

In the rural districts sanitary surveys were made of the 85 schools, 99 stores, and 97 churches. In the survey of schools and churches special inquiry and inspection were made in respect to water supplies and methods of excreta disposal.

In the last three months of the survey practically all of the town homes and 2,006 homes selected as representative of all the rural homes in the county were revisited to ascertain the degree of sanitary improvements which had been effected by the educational work.

FINDINGS IN RURAL SECTIONS.

Of the 3,918 dwellings visited in the rural sections full data were obtained at 3,229. At the remainder, due either to the house being unoccupied or to the occupants being away from home, only some of the data could be obtained.

Popular attitude toward the work.—At only two (or 0.06 per cent) of the homes visited did the investigators fail to meet with a cordial reception. The citizens generally seemed anxious to cooperate in the study and to obtain suggestions about needed corrections of insanitary conditions at their homes.

Race.—At 2,949 homes (about 92 per cent) the family was white and at 239 homes (about 8 per cent) colored. For 41 occupied homes this datum was not recorded.

Number in household.—The number of persons in 3,180 homes at which the number in the household was enumerated was 14,072. Thus the average for each home in the rural section of the county was 4.7.

Number of rooms to house:	Dwellings.
With 1 room	11
With 2 rooms	297
With 3 rooms	746
With 4 rooms	720
With 5 rooms	662

Number of rooms to house—Continued.	Dwellings.
With 6 rooms	470
With 7 rooms	150
With 8 rooms	81
With 9 rooms	23
With 10 rooms	16
With 11 rooms	7
With 12 rooms	2
Over 12 rooms	3
	3, 188
Not stated	41
Total	3, 229

Construction of house:	
Frame	3, 154
Brick	5
Log	44
Not stated	26
Total	3, 229

General cleanliness.—Recorded as good for 1,570 homes, fair for 1,171 homes, poor for 461 homes, and not stated for 27 homes.

Screening in summer.—At 1,342 homes the screening of dining room and kitchen was complete, at 639 the screening of dining room and kitchen was incomplete and served as a means of excluding probably 50 per cent of the flies seeking admission, at 1,135 (or 36.4 per cent) of the homes there was no screening of dining room or kitchen, and at 113 homes the presence or absence of screening was not recorded.

Sale of foods.—From 215 of the homes milk was sold, from 19 vegetables, and from 23 fruits were sold. Most of these foods were sold in near-by markets, but from 81 of the homes milk or milk products, fresh vegetables, or fruits were distributed through the channels of interstate commerce.

Topography.—One thousand three hundred and eighty-nine of the home premises were on rolling ground, 1,390 on flat ground, and 450 on hilly ground.

Animals on premises.—At 1,428 homes all barnyard animals were kept, and at 28 country homes none were kept. There were cows at 1,219 homes, horses at 1,237, poultry at 1,671, hogs at 960, dogs at 680, and cats at 614.

Stable manure.—Of all the rural homes in the county at which barnyard animals were stabled there was not one at which provision was made to prevent stable manure from serving as a breeding place for flies.

Water supply.—Water for drinking and culinary purposes was obtained from wells at 2,152 homes, from springs at 136 homes, from cisterns at 628 homes, and from town (piped) supply at 13 homes. For 300 homes there was no source of water supply on the immediate premises.

Into 57 sources of water supply there was drainage directly from insanitary privies.

Of the 2,916 wells, springs, and cisterns in use, 144 were within 50 feet of the privy, 483 were between 50 and 100 feet distant, 1,154 were over 100 feet distant, and for 1,135, located for the most part on premises without privies, this datum was not recorded.

Of the 2,916 wells, springs, and cisterns, 1,586 had curbings, 460 had none, and for 870 information as to curbing was not recorded. Of the 1,586 curbings, 315 were of brick, 140 of brick and cement, 189 of cement, 256 of tile, 15 of stone, 526 of wood, 13 of dirt, and 132 of steel.

Of the 2,288 wells and springs in the rural districts, 2,203 had casings, 85 had none. Of these 2,203 casings, 760 were of brick, 18 of stone, 339 of plank, 403 of steel pipe, 623 of terra cotta, and of 60 the material was not recorded. Of the 2,152 wells, 793 were dug, 1,317 were drilled, and for 42 the character of the well was not recorded.

Of the 2,152 wells, 5 were under 10 feet in depth, 152 were between 10 and 25 feet deep, 893 were between 25 and 50 feet deep, 655 were between 50 and 100 feet deep, 309 were over 100 feet deep, and the depth of 138 was not recorded.

Of the 2,780 wells and cisterns, 2,003 were provided with buckets and 645 with pumps. For 132 the means for lifting the water was not recorded. Of the 2,780 wells and cisterns, 670 had tight platforms, 2,045 had leaky platforms or none at all, and for 65 this datum was not recorded. Of the 628 cisterns, 541 were judged to be water-tight, 82 were not, and for 5 this datum was not recorded.

The water supply from the 2,916 private sources in the rural districts was judged by the investigator to be safe in 730 instances, unsafe in 1,858, and in 328 instances the opinion of the investigator was not recorded. The water supply used by the family was regarded by responsible members of the household, however, as safe at 2,476 of the homes, unsafe at only 126, and the families at 314 of the homes would not risk an opinion on the safety of the water supply used by them.

Disposal of human excreta.—Definite data on the type of toilet in use for the collection and on the methods of disposal of human excreta were recorded for 3,130 rural homes. Ten of the homes were provided with water-closets, 2,073 with privies, and at 1,047, or 33.42 per cent, of the homes no toilet of any kind was provided. Of the 10 water-closets, 2 emptied into insanitary cesspools, 3 discharged on the surface of the ground near by the dwelling, and 5 emptied into septic tanks with apparently sanitary subsoil distribution of effluent.

Of the 2,073 privies, only 2 were provided with water-tight receptacles and of fly-proof construction ("A" type) ; 8 were provided with water-tight receptacles, but were not of fly-proof construction ("B" type) ; 6 were fly-proof, but had no receptacles to prevent soil pollution ("C" type) ; 133 were boarded up at the back and sides to exclude chickens and other larger animals, but were neither provided with water-tight receptacles nor of fly-proof construction ("D" type) ; and 1,924 were open in back, with contents accessible to chickens and other domesticated animals, soil polluting and grossly insanitary ("E" type).

Thus, of all these homes, only seven, or 0.22 per cent, were provided with equipment for the sanitary disposal of human excreta.

At 14 of the country homes the privy was cleaned daily, at 219 weekly, at 114 twice monthly, at 546 monthly, at 44 every two months, at 417 every three months, at 109 every six months, at 130 once a year, at 199 never, and for 281 homes this datum was not recorded. At 1,307 country homes the privy contents were buried, at 508 scattered, at 3 hauled away by scavenger, at 12 dumped into the river, at 14 allowed to drain downhill, at 32 left for barnyard animals to scatter, and at 197 homes the method of "cleaning" was not recorded.

Schools.—In all, 85 schools were surveyed. Of these 34 were for white children, 5 for colored, and for 46 schools the race of the school children was not recorded. Fifty-five schoolhouses were in good condition, 22 were in poor condition, 6 were only fair, and the impression made by the schoolhouse was

ot recorded for 2. Seventy-seven of the school buildings were of frame, six
ere of brick, and for two the construction of the building was not recorded.
ifty-three schools had but one room, 12 had 2 rooms, 5 had 3 rooms, 3 had 4
ooms, 5 had 5 rooms, 1 had 8 rooms, 1 had 12 rooms, and the number of
ooms for 3 schools was not recorded.

The general cleanliness was good for 35 schools, fair for 43 schools, poor for
schools, and for 2 schools this datum was not recorded.

Twelve schools obtained drinking water from cisterns, 45 from wells, 3 from
ie city supply, 24 schools had no water supplies on the school premises, and
r 1 the datum was not recorded.

Of the 57 wells and cisterns at the schools, 29 were protected to some
egree from surface drainage by curbings, and for 28 the presence or absence
f curbing was not recorded. Of these 29 curbings, 7 were of brick, 1 was of
rick and cement, 4 were of tile, 7 were of cement, and 6 were iron pipe. For
this datum was not recorded.

Of the 57 wells and cisterns, 3 were within 50 feet of privies, 5 were be-
veen 50 and 100 feet, 41 were over 100 feet distant from privies, and for 8
ie datum was not recorded.

Of the 57 wells and cisterns 11 were lined with brick, 7 with tile, 3 with
ment, 24 with iron pipe, 1 with wood, 1 with brick and cement, and for 10
ie character of the casing was not recorded.

Of the 45 wells on school premises 11 were dug and 34 were drilled. Three
f these wells were between 10 and 25 feet deep, 8 were between 25 and 50
et deep, 14 were between 50 and 100 feet deep, 13 were over 100 feet deep,
id for 7 the depth was not recorded.

Of the 57 wells and cisterns 28 had buckets and 29 had pumps. Thirty-two
f the wells and cisterns at the schools had tight platforms and 25 had leaky
atforms or none at all. Of the 12 cisterns 10 were water-tight and 2 were
ot. Three of the cisterns had protected tops, nine had none.

Of the 60 water supplies for schools the opinion of the investigator was that
2 were safe and that 28 were unsafe or doubtful.

Sixty-six schools had privies, 17 had none, and for 2 the presence or absence
f toilets was not recorded. All of the 66 privies were insanitary. In 2 of
iese boards against the back of the house prevented access to the filth by
iickens and barnyard animals, the other 64 lacked even this small degree of
rotection. All of them were soil polluting and their contents were accessible
flies.

The average sanitary score for the 85 schools, based on a maximum of 100
er cent, was 28.4 per cent.

Churches.—Ninety-seven churches were surveyed. The general appearance
f the buildings was good in 71 cases, fair in 24, poor in 1, and for 1 church this
itum was not recorded.

Eighty-four churches were built of wood, 10 were of brick, 1 was of stone,
id for 2 the construction was not recorded.

The general cleanliness was good for 58 churches, fair for 35, poor for 1,
id in 3 instances this datum was not recorded.

Fifteen churches had water supplies on the premises, 52 had none, and for
0 churches the presence or absence of water supply was not recorded. Of the
5 churches with recorded water supplies wells furnished the water in 9 in-
ances, cisterns in 4, springs in 1, and 1 church used the town water supply.

Of the 9 wells 4 were dug, 5 drilled. Three of these wells were between
5 and 50 feet deep, 2 were between 50 and 100 feet deep, and 4 were over
00 feet deep.

Of the 13 wells and cisterns 7 had buckets and 6 had pumps, 7 had tight platforms, and 6 had leaky platforms or none at all. Two of the cisterns were recorded as water-tight and 2 doubtful.

Of the 15 recorded water supplies 5 were considered safe, 1 unsafe, and for 9 the sanitary quality was not recorded.

Of the 97 churches 14 had privies, 83 had none. All of these 14 privies were grossly insanitary, soil-polluting, open-back privies, having neither water-tight vessels nor fly-proof boxes.

The average sanitary score for the 97 churches, based on a maximum of 100 per cent, was 12.1 per cent.

Stores.—Ninety-nine stores were surveyed. Twenty-one were built of brick, 74 were of wood, and for 4 the character of construction was not recorded.

The general cleanliness of 34 were good, of 47 fair, of 13 poor, and of 5 not recorded. Forty-two stores were completely screened against flies, 17 were partially screened, and 40 had no screens.

Twelve stores had wells, 9 obtained water from the town supply, 5 had cisterns, 60 had no water supply on the premises, and for 13 the presence or absence of a store water supply was not recorded.

Of the 12 wells, 5 were dug and 7 were drilled. Six of the wells were between 25 and 50 feet in depth, 5 were between 50 and 100 feet deep, and 1 was over 100 feet deep.

Of the 17 wells and cisterns, 9 had buckets, 5 had pumps, and for 3 the means for lifting the water was not recorded. Of the wells and cisterns 3 had tight platforms, 12 had leaky platforms or none at all, and for 2 this datum was not recorded.

Twelve of the 26 water supplies for stores were considered safe by the investigator and 14 were considered unsafe.

Ten of the stores had privies, 88 had none, and for 1 information as to the presence or absence of a toilet was not recorded. All of these 10 privies were insanitary. In 2 of them slight effort had been made to prevent access to the filth and its subsequent scattering by barnyard animals by placing boards against the back of the privy, while the 8 others were grossly insanitary, soil-polluting, open-back privies.

The average sanitary score for the 99 stores, based on a maximum of 100 per cent, was 15.3 per cent.

County health administration.—For the administration of health affairs in the whole county—town and rural sections—there was one man, the county health officer, appointed by the county court at a salary of $600 per annum for part-time service. The only duties expected of the health officer were the giving of medical care to the county poor and to those in the county jail, and the enforcement of quarantine measures in cases of the major quarantinable diseases, such as smallpox.

Sanitary rating.—At 3,276 of the rural dwellings a score was estimated and recorded on excreta disposal, water supply, screening, and general cleanliness. The average sanitary rating for these dwellings was 31.3 per cent. Sixty-seven were scored under 5, 458 between 5 and 15, 818 between 15 and 25, 1,659 between 25 and 55, 231 between 55 and 75, and only 43 over 75.

FINDINGS IN INCORPORATED TOWNS.

The aggregate number of homes canvassed and surveyed in the seven incorporated towns—Union City, Obion, Troy, Kenton, Rives, South Fulton, and Samburg—was 1,630.

Race.—Of the 1,630 homes, the families were white at 1,016, negro at 588, and at 26 the race of the family was not recorded.

Number in household.—The number of persons in 1,601 homes at which the number in the household was enumerated was 6,679—an average of 4.1 per home.

Animals on premises.—At 11 of the homes cows, horses, poultry, hogs, dogs, and cats were kept. At 535 of the homes none of these animals were kept. At 173 there were cows, at 240 horses, at 882 poultry, at 85 hogs, at 269 dogs, and at 258 cats.

General cleanliness.—Recorded as good for 856 of the premises, fair for 483, poor for 274, and not recorded for 17.

Screening in summer.—Eight hundred and fifty-six dwellings were completely screened, 335 partially, and 439 had no screening.

Water supply.—Nine hundred and seventy-three homes were furnished with water from public (piped) supplies, 407 from wells, 29 from cisterns, and 221 obtained water from neighbors' supplies or from street hydrants.

Twenty-seven of the private sources of water supply were down slope from and obviously exposed to surface drainage from near-by privies.

Of the private sources of supply, 74 were within 50 feet of an insanitary privy, 163 were between 50 and 100 feet from a privy, and 199 were over 100 feet from a privy. Two hundred and sixty-six wells were equipped with buckets and 141 with pumps. About 50 per cent were protected to some degree against surface drainage by curbing or tight platforms, and about 30 per cent were protected against subsoil seepage by water-tight casing.

Of the 407 wells, 139 were dug and 268 were drilled. One was less than 10 feet deep, 66 between 10 and 25 feet deep, 211 between 25 and 50 feet, 85 between 50 and 100 feet, 25 over 100 feet, and for 19 the depth was not recorded.

Of 1,384 homes at which opinions on the subject from the heads of the households were obtained, the water was regarded as safe by 1,369 and as unsafe by only 15. The investigators, however, regarded the water supplies used at 331 of these homes as unsafe.

Disposal of human excreta.—Of the 1,630 homes, 199 were provided with water-closets, 1,332 were provided with privies, and at 99 there was no toilet on the premises.

Of the water-closets, 187 were connected with a public sanitary sewerage system, 11 with private sanitary sewerage systems (septic tanks with sanitary disposal of effluent), and 1 was connected with an insanitary cesspool.

Of the 1,332 privies, none was sanitary—125 were "D" type and 1,207 were "E" type.

Thus, of all the town homes, only 198—almost all of which were within the sewered area of Union City—were provided with equipment for cleanly disposal of human excreta.

Sanitary rating.—The average sanitary rating of the town homes was 48.6 per cent. Of the 1,583 homes for which a sanitary score was recorded, 22 were scored under 5, 135 between 5 and 15, 122 between 15 and 25, 708 between 25 and 55, 384 between 55 and 75, and 212 over 75.

Health administration.—None of the towns had a local health organization. The abatement of nuisances and other sanitary measures in a very general way came under the police authority of the town council; but the observance of sanitary principles depended almost entirely upon the judgment and the inclination of the individual citizen.

Union City.—Union City was the only town in the county found to have a sewer system. The sewage, after being passed through a septic tank, was discharged into a stream. About 80 per cent of the dwellings occupied by the white families were connected with the sewerage system, but only about 5 per cent of the dwellings occupied by negro families were so connected. At a considerable proportion of the homes provided with water-closets there was an insanitary privy in the yard for the use of servants.

Of the 996 houses, including dwellings, stores, and other buildings occupied by persons all the time or a part of the time, 244 were connected with the sewerage system. The provision for disposal of human excreta at these houses were as follows:

	Number of houses.
Having only water-closets connected with the city sewer	220
Having both sewer connection and insanitary privy	24
Having privies with water-tight receptacle and screened against flies (sanitary privies)	0
Having privies with either water-tight receptacles or screened against flies	2
Having privies excluding domestic animals but not fly proof	98
Having open-back, grossly insanitary privies, permitting free scatterment of privy contents and freely accessible to flies and all domestic animals	616
Having neither sewer connection nor privy of any kind	39

For the cleaning of privies a public scavenger system was operated, but its service was inadequate and its methods faulty.

This town was found to have an excellent public water supply, obtained from deep-bored wells. The vast majority of the homes used water from the public (piped) supply, which from both field and laboratory studies, was found to be of good sanitary quality.

Besides the public supply there were 68 private sources of water supply in use. These were classified as to their character and as to whether or not they were protected against possible entrance of filth about their tops, as follows:

Kind of supply.	Total number.	Number properly protected.	Number not properly protected.
Dug wells	58	30	28
Bored wells	9	1	8
Cisterns	1		1
Total	68	31	37

Thus, of the 68 private sources of water supply, 37 were not protected about the top in such a way as to exclude the entrance of filth.

Besides the dangers of pollution from the top, every well was constantly in danger of pollution by seepage from the soil, overloaded with filth from the numerous insanitary privies located near them. The average distance between privy and well on the same lot was under 68 feet. There were several as close as 10 feet to the well. The average depth of the wells was a little under 28 feet.

Obion.—In Obion 351 dwellings were surveyed.

The water supply was derived from a public (piped) supply and from private wells. The public supply was obtained from a deep-bored well and was found to be of good sanitary quality. Of the 351 dwellings in Obion, 89 were furnished with water from the public supply, but 9 of these 89 had also private wells which were used to some extent. The private sources of drinking water were classified as to their character and as to whether or not they were proprly protected against the possibility of the entrance of filth about their tops, s follows:

Kind of supply.	Total number.	Number properly protected.	Number not properly protected.
ug wells	31	6	25
ored wells	9	3	6
rilled wells	74	73	1
riven wells	38	35	3
Total	152	117	35

Thus, of the 152 private sources of water supply, 35 were not protected about he top in such a way as to exclude the entrance of filth. The number proprly protected was gratifyingly large, however, because of the large proportion f drilled or driven wells with water-tight casing. The dug wells were all ad. The average distance between privy and well on the same lot in Obion vas under 96 feet. The average depth of the wells was slightly under 50 feet.

Conditions in Obion as to provisions for human filth disposal were found to e as follows:

	Number.
Iomes using water-closet with septic tank or open sewer	8
Iomes having both water-closet and insanitary privy	4
'rivies with water-tight receptacles and screened against flies (sanitary privies)	0
'rivies with either water-tight receptacles or screening against flies	1
'rivies excluding domestic animals, but not fly tight	20
)pen-back, grossly insanitary privies, permitting free scatterment of privy contents and freely accessible to flies and all domestic animals (public nuisances)	284
Iomes having neither sewer nor privy of any kind	36

Thus practically all human excreta in the town of Obion went directly into r on the soil and so endangered the local water supplies and, through coneyance by water, flies and other agents, the health of the community. The ublic-scavenger service was inadequate and faulty.

Troy.—During the course of the survey, every home in Troy was visited—129 n all—and accurate information was collected as to the source of water suply, the method of disposal of human excreta, and other salient features of saniation.

This town was without a public-water supply, and there were on the 129 remises 86 private sources of supply. These sources of supply were classified s to their character, and as to whether or not they were properly protected gainst the possibility of the entrance of filth about their tops, as follows:

Kind of supply.	Total number.	Number properly protected.	Number not properly protected.
ug wells	56	27	29
ored wells	7	1	6
rilled wells	3	3	....
isterns	20	10	10
Total	86	41	45

Thus it is seen that of the 86 sources of supply, 45, or more than half, were ot protected against pollution from the top. For 21 premises water was obtained from the courthouse well, and for 43 the water supply was obtained from neighboring premises. Besides the danger of pollution from the top, the sources of water supply were in constant danger of pollution by seepage, on account of their proximity to insanitary privies. The average distance between the well and privy on the same lot was slightly under 63 feet. Thirty-one of the wells were only 50 feet distant from the privy. The average depth of the wells was about 30 feet.

At the time of the survey there were within the limits of the town 84 privies. These were classified as follows:

	Number.
Privies with water-tight receptacles, screened against flies	0
Privies with water-tight receptacles, unscreened against flies	0
Privies excluding domestic animals, but not fly-tight	4
Open-back, grossly insanitary privies, permitting free scatterment of privy contents, and freely accessible to flies and to domestic animals (public nuisances)	80

The 45 remaining premises had no toilet of any kind. Thus all the human excreta within the town of Troy went directly into or on the soil, and so endangered the water supplies and caused extensive contamination by flies. Troy had no public scavenger service to effect the cleaning of privies.

Rives.—All of the 162 dwellings in Rives were surveyed. This town was without a public water supply, and there were on the 162 premises 99 private sources of water supply. These were as follows:

Kind of supply.	Total number.	Number properly protected.	Number not properly protected.
Dug wells	12		12
Bored wells	35	12	23
Drilled	36	35	1
Driven	7	3	4
Cisterns	9	3	6
None	65		
Total	99	53	46

Thus it is seen that of the 99 sources of supply, 46, or almost half, were not protected about the top in such a way as to exclude the entrance of filth. Besides the danger of pollution through the top, the wells were in constant danger of pollution by seepage from the soil overloaded with filth from the numerous insanitary privies located near them. The average distance between the privy and the well on the same lot in Rives was under 90 feet. The average depth of the wells was under 60 feet.

At the time of the survey there were within the limits of Rives 128 toilets, classified as follows:

	Number.
Water-closet with open-sewer drain	1
Privies with water-tight receptacles and screened against flies	0
Privies with water-tight receptacles or screened against flies	0
Privies excluding domestic animals, but not fly tight	6
Open-back, grossly insanitary privies (public nuisances)	122

On the 33 remaining premises there was no toilet of any kind. Thus all the human excreta within the town of Rives went directly into or on the soil and were freely exposed to flies and the various other agents of dissemination. There was no public scavenger service for the cleaning of privies in this town, and this work was seldom done; and when done, it was done in a very insanitary manner.

South Fulton, Kenton, and Samburg.—None of these towns had a public water supply or sewer system. The sanitary conditions presented were generally similar in character but of somewhat lower grade than those in the other unsewered towns.

PREVALENCE OF TYPHOID FEVER AND OTHER DISEASES.

Of 14,072 persons enumerated in the course of the canvass of the country homes, 1,807, or 12.84 per cent, gave a history of having had typhoid fever; and of 6,679 persons enumerated in the canvass of the town homes, 640, or 9.58 per cent, gave such history.

The findings indicated that the rate of prevalence of typhoid fever in Obion County had been high. Histories were obtained of 128 cases occurring in 1915, which number probably was considerably below the actual. Of the cases occurring in 1915, according to the statements obtained, at the bedsides of less than 15 per cent did the use of disinfectants and the exercise of other precautionary measures approach efficiency.

According to the reports made to the bureau of vital statistics of the State board of health, 16 deaths from typhoid fever occurred in Obion County in 1915, giving the county for that year a typhoid death rate of about 53 per 100,000 population.

Besides the cases of typhoid fever, the histories of cases of illness in the county in 1915 and at the time of the visit obtained in the course of the house-to-house canvass were as follows:

Nature of illness.	Number of cases.		Nature of illness.	Number of cases.		Nature of illness.	Number of cases.	
	In 1915.	At time of visit.		In 1915.	At time of visit.		In 1915.	At time of visit.
Abscess	4	3	Fibroids	3	1	Osteomyelitis	2	......
Alcoholism	1	......	Fistula	1	......	Panophthalmitis	1	......
Anemia	1	......	Fracture	4	5	Paralysis agitans	1	......
Apoplexy [1]	11	3	Gall stone	12	......	Paresis	1	......
Appendicitis	21	6	Gastric ulcer	2	1	Pellagra	6	......
Arteriosclerosis	1	......	Gastritis, acute	1	......	Pleurisy	6	......
Arthritis deformans	1	......	Goiter	2	......	Pneumonia [8]	117	3
Ascaris lumbricoides	7	......	Grippe [5]	200	2	Pott's disease	1	......
Asthma	5	......	Hemorrhoids	1	1	Prost. Hyp.	1	......
Biliousness [2]	42	......	Hay fever	2	......	Puerperal fever	......	1
Blood disorder	1	......	Heart disease	17	6	Quinsy	1	......
Brain congestion	1	......	Heat stroke	1	2	Rheumatism	52	10
Bronchitis	10	2	Hernia	3	......	Rickets	1	......
Cancer	5	1	Hives	1	......	Ringworm scalp	......	1
Catarrhal fever	2	......	Impetigo	......	1	Riggs disease	1	......
Chicken pox	5	2	Indigestion	6	2	Scarlet fever	20	......
Cholera infantum	4	1	Infant paralysis	1	......	Sciatica	1	......
Colic	5	......	Intestinal obstruction	1	1	Septicemia [9]	5	......
Cretinism	1	......	Jaundice	1	......	Shingles	1	1
Croup	3	......	Lumbago	4	1	Sprain	......	......
Cystitis	1	......	Malaria [6]	788	68	Stomach trouble	23	6
Dementia senile	1	1	Mastoiditis	......	1	Syphilis	1	......
Diabetes	1	1	Measles	17	5	Teething	2	3
Diphtheria	49	1	Meningitis	5	......	Tonsillitis	54	2
Dropsy	4	......	Migraine	2	1	Trachoma	2	2
Dysentery [3]	90	30	Mumps	20	1	Tuberculosis	50	22
Earache	2	......	Nephritis [7]	22	7	Tumor	1	......
Eczema	1	1	Nervousness	5	2	Uremic poison	1	......
Enterocolitis [4]	26	11	Neuralgia	7	......	Varicose veins	1	1
Epilepsy	3	......	Neuresthenia	5	......	Vertigo	1	1
Erysipelas	6	1	Neuritis	1	......	Whooping cough	47	13
						Womb trouble	11	6

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[1] The terms "paralysis" and "hemiplegia" comprised also under the head of apoplexy.
[2] Biliousness probably signifies malaria in many instances.
[3] Also diarrhea and flux.
[4] Also iliocolitis and summer complaint.
[5] Also influenza and bad colds.
[6] Also chills, chills and fever, bilious fever.
[7] Also kidney trouble.
[8] It is thought probable that some of these cases called "pneumonia" were in reality tuberculosis.
[9] Also blood poisoning.

Of 20,751 persons enumerated in the course of the canvass of the homes, 244, or 1.17 per cent, were at the time of the visit ill enough to be in bed or to be incapacitated for work, indicating that at least this percentage of persons in the county are definitely sick all the time.

In view of the fact that many things besides making the inquiry about illness in the family were done in the visit to the home, it is highly probable that the percentage of morbidity found was considerably below the actual.

SANITARY MEASURES RECOMMENDED.

For the country homes, improved methods of excreta disposal, protection of water supplies against pollution, and screening of dwellings to exclude mosquitoes as well as flies were generally recommended.

For the towns the measures particularly recommended were (1) the installation or the extension of public water supplies of good sanitary quality and the abolishment or the improvement of private sources of water supply as rapidly as practicable, and (2) the installation of sanitary privy systems with adequate and efficient scavanger service at once, and the installation or extension of sanitary sewerage systems as soon as practicable.

For both country neighborhoods and towns the prompt reporting of cases of typhoid fever and of other infectious diseases, with the carrying out of proper precautions at the bedsides of such cases, was urged. Antityphoid vaccine was obtained from the hygienic laboratory of the Public Health Service and furnished without cost for use by the family physicians among persons closely associated with typhoid fever patients. In the period of the survey 1,200 doses of the vaccine so furnished were administered without charge by the county health officer and by the other local practitioners of medicine.

Upon the completion of the survey of each town a written report with specific recommendations, including in each instance a draft of a sanitary ordinance needed, was presented to the town council. In every town except South Fulton an ordinance relating to the sanitation of privies was adopted and enforced with more or less vigor by the town council. In South Fulton the enforcement of such an ordinance was more needed than in any other of the towns. A sanitary ordinance for South Fulton was approved by the council on its first two readings, but at the third reading, when it was to become effective, the mayor stated that he would not enforce the ordinance if it were adopted. Therefore, on the recommendation of the survey officers, the ordinance was not passed. Toward the end of this survey period this mayor, when told that his town was the only one with a population of over 1,000 in all the 15 counties surveyed which would have to be recorded as having made, through action of the town council, no sanitary progress, stated that that would make no difference, because South Fulton was so low in the scale that nothing said about it could hurt it. It is regretted that a photograph of that mayor, elected by the voters and presiding over the destinies of an American community of over 1,000 persons, was not obtainable for presentation in this report.

Every consideration was given to ways and means of securing for the future an efficient health administration for Obion County. The part-time county health officer had, under the terms of his appointment, three more years to serve. From the study of the situation it did not appear in the period of the survey that the time was ripe for an agitation for a whole-time county health officer. Therefore, as a beginning, the appointment of a whole-time sanitary inspector to serve under the county health officer was recommended. This recommendation was given considerable favorable publicity in the local press; and, at the close of the survey, appeared to have a fair chance of consummation.

COOPERATION.

Good cooperation in the work was given by the State board of health, the county health officer, the business and civic organizations, most of the town councils, the County Fair Grounds Association, the local newspapers, the local physicians, the clergymen, and by many prominent individual citizens.

The State health officer and the statistician of the Tennessee Board of Health visited the county on several occasions to confer with the officers making the survey, to address public meetings, and otherwise to help the work in every way they could.

At the county fair, held at Union City, September 6–9, a good demonstration in sanitation was made. The business men of Union City furnished models of septic tanks, sanitary privies, and sanitary wells, which were set up as an exhibit on one of the stands; and the fair grounds' committee agreed to have all privies on the grounds, for practical use by the visitors, to be made of sanitary type so they would serve as a practical demonstration in sanitation.

Throughout the period of the survey the local newspapers gave the work excellent publicity.

The town council and the local business men generally of Union City were particularly active in their support of the program of sanitation recommended.

RESULTS.

Country homes.—Groups of representative country homes in different neighborhoods were revisited to ascertain the degree of sanitary improvement accomplished subsequent to the first visit of the survey. The aggregate number of homes in these groups was 2,005.

At 179, or 8.92 per cent of these 2,005 homes, marked improvement in equipment for and methods of disposal of human excreta was found, and at an additional 23, or 1.14 per cent, either sanitary privies (21) or septic tanks for water-closet connections (2) were in process of construction.

Included in this number of homes, 179, at which improvement in excreta disposal had been effected, were 90 at which sanitary ("A" type) privies had been installed, 11 at which the Mosaic method of disposal had been adopted, and 3 at which sewerage systems with water-closets and good septic tanks had been installed. Thus, of the 2,005 homes, 104, or 5.18 per cent, had established high-grade sanitary disposal of human excreta.

Besides the improvements in excreta disposal, marked progress had been made in the protection of water supplies at 25, or 1.2 per cent, and in screening at 45, or 2.3 per cent.

The degree of sanitary improvements at these homes is indicated in the following table:

Improvements.

[O=No toilet. A, B, C, D, E=Different types of privies. M. M.=Mosaic method. S. T.=Septic tank.]

	Excreta disposal.									
	A.	B.	C.	D.	E.	M. M.	S. T. W. C.	Regular cleaning	Building.	
									A.	S. T.
O to	18	5	2	3	4	11	1		2	
E to	72	13	8	26			2	14	19	2
Total	90	18	10	29	4	11	3	14	21	2

Improvements—Continued.

	Water supply.				Screening.	
	Pro-tected top.	Pump.	New.		Complete from—	Partial from—
			From—	To—		
O to	....	....	[1] 1	[2] 1	[1] 28	[3] 9
E to	20	....	[3] 4	[2] 4	[4] 8	....
Total	20	....	5	5	36	9

[1] Cistern. [2] Drilled well. [3] None. [4] Partial.

The sanitary ratings given 240 of the rural homes on the original and on the final round of survey, with the increase which resulted in the intervening period, are shown in the following table:

Sanitary rating.

On original survey.	On final survey.	Gain.	On original survey.	On final survey.	Gain.	On original survey.	On final survey.	Gain.
8	22	14	26	56	30	32	62	30
25	35	10	28	46	18	45	75	30
35	40	5	35	65	30	29	49	20
25	55	30	20	70	50	25	50	45
20	30	10	37	82	45	5	15	10
33	42	9	35	80	45	20	45	20
51	56	5	35	45	10	55	100	45
26	66	40	20	28	8	42	87	45
45	55	10	30	40	10	37	52	15
20	37	17	25	35	10	37	77	40
36	48	12	39	52	13	16	26	10
5	15	10	32	37	5	10	40	30
25	30	5	27	67	40	33	43	10
15	25	10	55	85	30	50	55	5
30	80	50	15	65	50	50	65	15
60	80	20	20	60	40	50	100	50
10	40	30	35	37	2	25	35	10
60	100	40	35	45	10	30	45	15
30	60	30	20	65	40	15	25	10
24	32	8	30	75	45	16	42	26
42	51	9	17	62	45	20	30	10
35	85	50	30	70	40	13	18	5
53	78	25	25	45	20	25	65	40
35	40	5	56	66	10	35	45	10
45	50	5	26	33	7	28	78	50
60	100	40	25	35	10	....	....	40
30	60	30	18	78	60	....	....	40
24	32	8	60	100	40	....	....	35
35	55	20	30	80	50	....	....	7
50	70	20	24	74	50	....	....	10
35	40	5	35	80	45	55	90	35
35	40	5	....	25	25	27	39	12
10	18	8	30	40	10	43	93	50
37	72	35	36	56	20	18	28	10
30	55	25	15	35	20	29	39	10
38	48	10	27	37	10	53	98	45
40	67	27	35	45	10	53	98	45
35	45	10	27	35	8	20	30	30
25	35	10	20	30	10	30	40	10
35	42	7	26	36	10	28	38	10
35	75	40	25	35	10	35	45	10
37	47	10	27	37	10	45	90	45
25	65	30	35	45	10	60	70	10
35	65	30	30	85	55	36	91	55
35	80	45	35	80	45	29	39	10
30	60	30	50	5	45	25	33	8
15	25	10	17	27	10	28	73	45
35	65	30	25	30	5	28	73	45
24	54	30	26	36	10	60	100	40

Sanitary rating—Continued.

On original survey.	On final survey.	Gain.	On original survey.	On final survey.	Gain.	On original survey.	On final survey.	Gain.
22	32	10	60	100	40	10	54	44
10	70	60	38	78	40	35	80	45
34	83	49	39	94	55	16	36	20
35	80	45	59	99	40	28	88	60
20	70	50	9	29	20	30	80	50
30	80	50	55	100	45	38	80	42
35	40	5	26	76	50	38	80	42
45	58	13	52	97	45	38	80	42
20	25	5	17	67	50	38	80	42
14	60	50	35	80	45	42	84	42
30	35	5	38	78	40	50	95	45
60	100	40	20	80	60	58	100	42
25	65	40	33	43	10	50	100	50
35	45	10	55	100	45	35	77	42
50	60	10	33	78	45	41	83	42
40	80	40	40	82	42	41	83	42
20	30	10	35	80	45	36	78	42
35	47	12	35	80	45	50	100	50
30	55	25	35	80	45	58	100	42
40	80	40	50	90	40	38	80	42
60	100	40	35	80	45	35	80	45
36	46	10	47	97	50	60	100	40
45	50	5	15	75	60	42	84	42
37	47	10	49	59	10	55	100	45
23	33	10	33	78	45	15	25	10
20	45	20	30	40	10	38	65	27
35	45	10	23	28	5	32	37	5
10	85	75	35	45	10	22	72	50
36	68	32	5	15	10	20	65	45
15	35	20	10	30	20	30	80	50
25	70	45	15	25	10	31	41	10

Total points gained	6,603
Total number of homes represented	240
Average gain	27.5

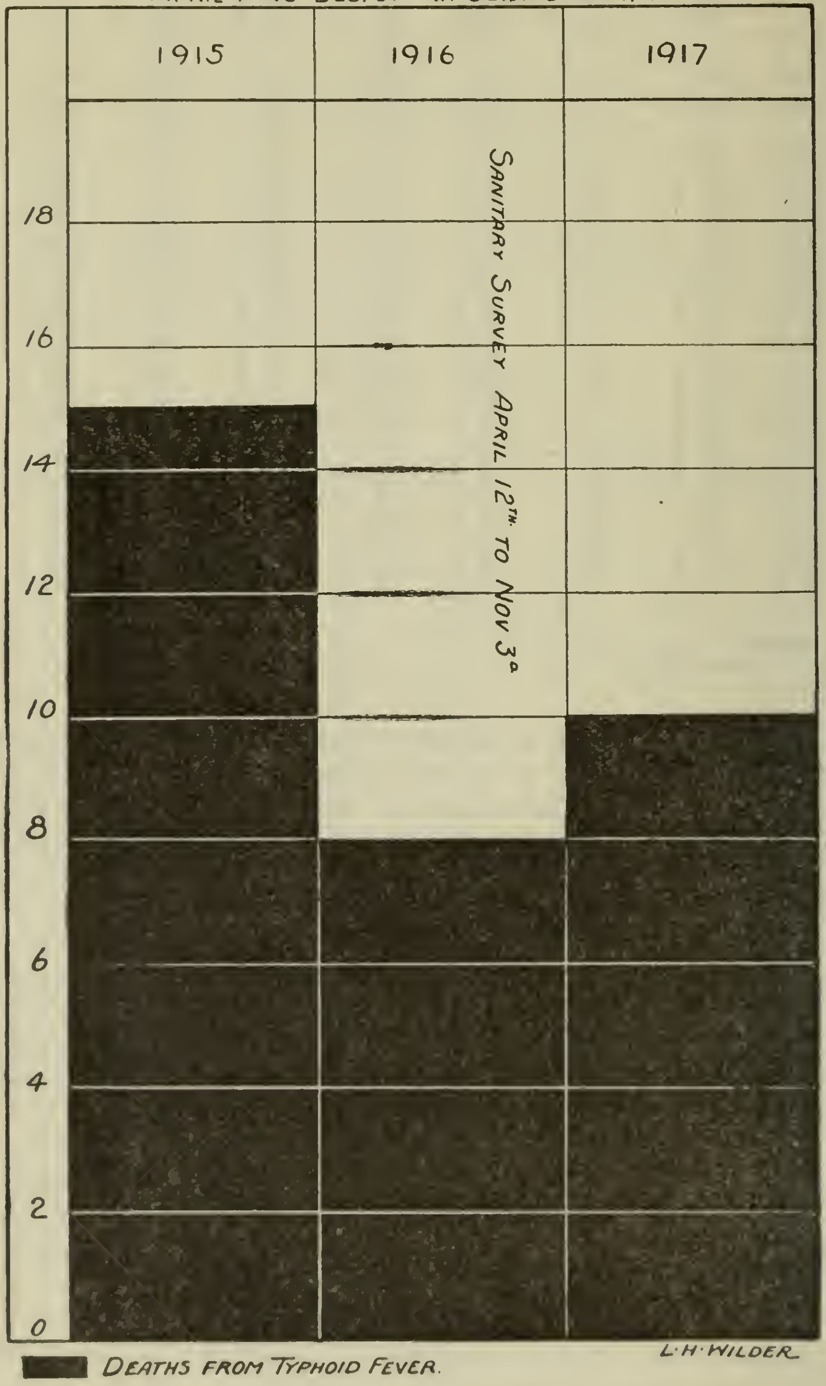
Incorporated towns.—Each of the seven incorporated towns was resurveyed in the last few weeks of the period of the survey. It was found that at 48.58 per cent of all the town homes having on the first survey either insanitary privies or no privies, high-grade sanitary ("A" type) privies or water-closets had been installed. Besides the improvement in excreta disposal, considerable progress was made at the town homes generally in screening of houses and in general cleanliness of premises.

In all of the towns except South Fulton ordinances of nearly similar character, requiring the installation of sanitary privies or of sanitary sewerage systems, were adopted. In all of the towns the equipments for and the methods of operating the scavenger service for cleaning of the privies were radically improved.

Union City.—An ordinance requiring all dwellings to be provided with either sanitary sewer connections or with sanitary privies was adopted June 20, to become effective July 20. The work of installing sanitary privies proceeded at first somewhat slowly, on account of the difficulty of getting a sufficient number of carpenters engaged, and the council generously extended the time for compliance with the ordinance. Of the dwellings affected by the ordinance, at 60 per cent the improvements had been made by September 22 and at 100 per cent the improvements had been made before November 1. Thus, in the period of the survey, 35 new sewer connections were made and about 800 sanitary privies were installed, giving every home in Union City proper equipment for sanitary disposal of human excreta. So far as could be ascertained in the course of a painstaking resurvey of all the homes in the last few days of the survey period, there was not a dwelling in Union City at which sanitary methods of excreta disposal were not in practice. The results in the town furnished an excellent demonstration in sanitation.

Obion.—In this town the sanitary ordinance was passed July 5 to become effective one month from date. It was extended on August 5, and again on

CHART 17 DEATHS FROM TYPHOID FEVER REPORTED IN PERIOD APRIL 1ST TO DEC. 31ST IN OBION COUNTY, TENN.



L. H. WILDER

October 6. By November 1, 55 per cent of the houses affected by the ordinance in the town of Obion had installed sanitary privies.

Troy.—In Troy the sanitary ordinance was passed June 7, the time for compliance being extended to October 16. By November 1, 50 per cent of the homes affected by the terms of the ordinance had complied therewith.

Kenton.—In Kenton the sanitary ordinance passed the first and second readings on September 5 and October 5, respectively. By the end of the survey, the time for the third reading, which was necessary before the ordinance should become a law, had not arrived. At the end of the survey only 4.5 per cent of possible improvements in excreta disposal had been made.

Rives.—The ordinance was passed October 5, but the time for compliance was extended indefinitely. At the close of the survey 4.5 per cent of possible improvements had been made.

South Fulton.—In South Fulton the sanitary ordinance was passed August 14 and rescinded September 4, 10 days before it became effective, because the mayor refused to enforce it. At the close of the survey 3 per cent of the houses concerned had made the necessary sanitary improvements.

Samburg.—A sanitary ordinance was passed on August 7, to become effective September 7. Time for compliance was extended one month. At the time of the close of the survey 25 per cent of the houses affected had made the necessary improvements.

Typhoid-fever reduction.—In the period April 1 to December 31, 1916, the number of deaths from typhoid fever reported in the county was 8, as against 15 for the corresponding period of the previous year (chart 17).

CONCLUSION.

In view of all the circumstances affecting the sanitary situation in this county, the results of the sanitary survey appeared reasonably successful. A good start in sanitary progress was made. To carry it forward at a good rate further work is necessary. There appears no cause for doubt that if the State or the county should furnish a reasonably adequate health force to continue the work from the point at which it was left by the Public Health Service, Obion County would deliver a high-grade demonstration in county-wide rural sanitation.

SANITARY SURVEY OF CLAY COUNTY, MO.

In response to a request from the State board of health the sanitary survey in 1916 was extended to a county in Missouri. Clay County, in the northwestern part of the State, appeared to present fairly representative conditions for the rural counties of Missouri and was selected for the work.

The survey of this county was begun July 8, 1916, and terminated November 2, 1916.

GENERAL CONDITIONS.

Clay County lies between the thirty-ninth and fortieth parallels of latitude, and between the ninety-fourth and ninety-fifth meridians of longitude. The southern border of the county is along the west bank of the Missouri River, and in part is directly across the river from Kansas City. Spanning the river and connecting Clay County with Kansas City are splendidly constructed bridges for traffic by wagon and trolley cars and by railway trains.

The diameter of the county from east to west is about 20 miles, and from north to south about 25 miles. The land area is 402 square miles.

From northwest to southeast the topography ranges from hilly to rolling and flat. In the northwestern corner of the county the drainage is westerly to the Platte River. Except for that the drainage is to the south and southeast into the Missouri River. One small river and numerous creeks carry the drainage. In the southeastern corner of the county is Cooley Lake, a fairly large shallow body of water.

The soil is essentially clay, with an admixture of loam, and in the southeastern portion of the county considerable areas have sand and gravel as the top stratum, with outcroppings here and there, especially along the river bluffs, of limestone. The soil is fertile and is particularly well suited for grazing purposes and for raising corn.

According to the census reports the population of Clay County in 1910 was 20,302. The average number of persons to the square mile was 50.5 for the whole county and 33.4 for the rural section. Ninety-four and one-tenth per cent of the population were white and 5.9 per cent negro. Eighty-seven and seven-tenths per cent were native white of native parentage, 5 per cent were native white of foreign or mixed parentage, and only 2.1 per cent were foreign born. Of persons 10 years old and over 3.9 per cent were recorded as illiterate.

The incorporated towns in the county, with their populations in 1910, were as follows: Excelsior Springs, with 3,900; Liberty, with 2,980; Smithville, with 680; Kearney, with 631; Missouri City, with 554; and Holt, with 274. North Kansas City, directly across the river from Kansas City, and Mosby were incorporated subsequent to 1910, and in 1916 had populations, respectively, of about 400 and 100.

Excelsior Springs is a health resort with numerous wells, called "springs," of a wide range of depths and furnishing waters with a wide range of mineral ingredients. The town is provided with three large and luxuriously appointed hotels, and otherwise in many respects is a very progressive community. North Kansas City and Missouri City are industrial communities. In the former there are a number of factories and in the latter there is a coal mine.

The other towns, including Liberty, the county seat, and Smithville, Kearney, Holt, and Mosby, are residential communities and centers of trade for the surrounding farming sections.

The principal industries are agriculture and stock raising. Corn is the big crop.

According to the census reports the number of farms in the county in 1910 was 2,113. The farms covered 92.4 per cent of the land area, with 88 per cent improved. The average farm had 112.5 acres, with 99 acres improved. The value of all farm property was given as $26,403,929, and of the land alone as $82.74 per acre. Of the farms 65.5 per cent were operated by owners, 34 per cent by tenants, and the remainder by managers.

The county is served by four railway lines and one trolley car line, all connecting with Kansas City.

The wagon roads generally were not " improved," but in 1916 an election was carried by a large majority for the issuance of bonds in the amount of $1,250,000 for a system of rock roads throughout the county.

The healthfulness of this county appeared to be about the average for that general section of the country. According to the statistics of the State board of health for 1910 the county had a birth rate of 20.63 per 1,000, and a death rate of 15.22 per 1,000.

PLAN AND SCOPE OF SANITARY SURVEY.

The general plan of the work in Clay County was the same as that followed in the other counties surveyed in 1916.

The circular letter signed by the Surgeon General of the Public Health Service and sent to the mailing list of the county, advising the families about the plan and purpose of the survey, was indorsed by the president of the Missouri Board of Health. The president of the State board lived in Liberty, and as he was well known to practically all citizens of the county, his signature added materially to the effectiveness of the letters.

The plan and purpose of the work were further made known to the citizens through good front-page articles in the local newspapers and through a series of public meetings in the first few days of the survey period. These meetings were held in the several chief centers of population in different parts of the county. The first was an outdoor meeting on the lawn of William Jewell College at Liberty. This meeting, held on Sunday night, was under the auspices of the pastors of the local churches and was attended by a large congregation. The second meeting, on the following night, was an open-air meeting in the central square at Excelsior Springs. A band concert immediately preceding the speaking helped to bring the people to the meeting and the crowd was larger than the range of the voice of the speakers. The preliminary meetings were addressed by the officer in general charge of the rural sanitation studies of the Public Health Service, by the president of the State Board of Health of Missouri, and by prominent local citizens, including, as a rule, the mayor of the town in which the meeting was held.

Early in the survey period, a general survey of all the incorporated towns in the county was made, and reports of findings with recommendations submitted to the respective town councils by the officer in immediate charge of the survey. Among the first things done on reaching the town was to find a local carpenter and persuade him to build a box and flue device such as was used to convert insanitary privies into sanitary type. Then, when the recommendation for sanitation of the privies was made to the town council, the device was on hand to be demonstrated.

The work in Clay County comprised (1) a canvass and a sanitary survey of all the rural homes in the county, (2) a sanitary survey of the seven incorporated towns, (3) a sanitary survey of schools, churches, railway stations, and post offices in the rural districts, (4) public addresses on the subject of sanitation, with lantern-slide illustrations, in all sections of the county, (5) distribution of literature on different phases of the subject of Sanitation, and (6) the epidemiologic investigation of cases of typhoid fever as they developed.

The force engaged in the detailed work consisted of five officers of the Public Health Service and one advanced medical student, from Columbia University, furnished by the State board of health.

The county was divided into districts for convenience in making the survey, the boundaries for the districts being railroads, streams, or county roads, which were arbitrarily selected and which formed readily recognizable boundaries. For transportation in visiting the rural homes the men used automobiles.

Endeavor was made in the visits to the country homes to ascertain by careful questioning the history of each family in respect to incidence of disease in general and of typhoid fever in particular. The survey of the premises was made usually in company with some member of the household, the head of the family where practicable. Attention was directed especially to human-excreta disposal, stable-manure disposal, water supplies, and the protection of foods from invasion by flies. Literature on excreta disposal, water supplies, typhoid fever, and other appropriate subjects was freely distributed.

Public lectures on sanitation were given from time to time in different neighborhoods. These were usually illustrated with stereopticon slides. In the course of the work 49 public lectures were given. The average attendance at these meetings was 70 people. Thus, besides instructions given to the individual citizens at the homes, about 3,500 of the people of the county heard the facts of sanitation explained at the public lectures.

A total of 4,446 homes were surveyed in the county. Of these, 2,262 were in country neighborhoods and the remainder in the incorporated towns. The survey of the rural districts included an inspection of 51 schools, 45 churches, 26 railroad stations, and 11 post offices. In the latter part of the survey period, when the schools were in session, short informal talks on school and home hygiene were given the pupils in the course of the inspection of the schools.

A second visit to every home in the county was not attempted. However, a second visit to every home in the towns at which an insanitary type of excreta disposal was noted in the original survey was made. A total of 1,308 homes in the towns were revisited to ascertain what changes, if any, had been made along lines of sanitary betterment since the first visit. In the last part of the period of the survey 500 homes in country neighborhoods in different parts of the county, selected with a view of obtaining a fair sample of the whole county, were revisited to ascertain the degree of sanitary improvement accomplished since the first visit of the survey.

FINDINGS IN RURAL SECTIONS.

Of the 2,262 dwellings visited in the rural sections, 197 were unoccupied, and at 235 the occupants were not at home, leaving 1,830 rural homes for which full data were obtained.

Popular attitude toward the work.—At only two of the homes visited did the investigators fail to meet with a cordial reception. At 839 homes responsible members of the households stated they would carry out promptly the sanitary measures suggested, and at 914 more the persons interviewed showed a keen interest in the measures suggested but did not state they would carry them out at once.

Race.—One thousand six hundred and ninety-nine of the homes visited were occupied by white families, 32 by colored families, and for 334 of the occupied homes the race of the family was not recorded.

Number in household.—The number of persons in 1,830 homes at which the number in the household was enumerated was 7,429. Thus, the average for each home in the rural sections of the county was four.

Number of rooms to house:	Dwellings.
With 1 room	11
With 2 rooms	129
With 3 rooms	311
With 4 rooms	453
With 5 rooms	438
With 6 rooms	405
With 7 rooms	173
With 8 rooms	192
With 9 rooms	43
With 10 rooms	44
With 11 rooms	4
With 12 rooms	9
Over 12	8
Not stated	42
	2, 262

Appearance of residence.—For 733 of the homes recorded as good, for 1,183 as fair, for 292 poor, and for 54 homes not recorded.

Construction of house:	
Frame	2, 154
Brick	41
Brick and frame	4
Log	15
Stone	10
Stucco	1
Frame and stone	2
Frame, log, and stucco	1
Frame and canvas	3
Tent	1
Frame and log	6
Cement	2
Tar paper	1
Stucco and frame	1
Not stated	20
Total	2, 262

General cleanliness.—The general cleanliness was recorded as good for 861 homes, fair for 1,135, poor for 259, and for 7 homes it was not recorded.

Cellar.—Four hundred and ninety-three homes had cellars, 1,631 had none, and for 138 homes the presence or absence of a cellar was not recorded.

Screening in summer.—At 1,269 homes the screening of kitchen and dining room was complete; at 480 the screening of kitchen and dining room was only partial, excluding perhaps half of the flies seeking admission; at 285, or 14.01

per cent. of the homes there was no screening; and for 228 homes the presence or absence of screening was not recorded.

Topography.—Seven hundred and seventy-eight of the home premises were on rolling ground, 292 on flat ground, 500 on sloping ground, 678 on hilly ground, and for 14 homes the topography was not recorded.

Animals on premises.—At 831 homes cows were kept; at 867 horses were kept; at 1,060 poultry; at 741 hogs; at 594 dogs; at 344 cats. At 976 homes all of the above named animals were kept, and at 130 homes none of them was kept.

Stable manure.—Of all the homes at which animals were stabled, at only 31 was provision made to prevent stable manure from serving as a breeding place for flies.

Water supply.—Water for drinking and culinary purposes was obtained from wells at 1,423 of the dwellings, from springs at 198, from cisterns at 497, from wells and cisterns at 29, from a town public supply at 36, and for 79 dwellings the potential source of water supply was not ascertained.

At 1,384, or 69.93 per cent, of the homes the source of water supply was apparently exposed to pollution with human excreta or other refuse matter, and the water in use was regarded by the investigator as unsafe. The water in use at 595 homes was regarded by the investigator as safe. For the other 283 dwellings the investigator's opinion on this point was not recorded. In contrast to the opinion of the investigator in respect to the safety of the water supplies in use was the opinion of the responsible members of the households canvassed. Definite statements of opinion on the character of the water supply were obtained from some responsible member of the household at 1,686 homes. At 1,580 of these the water supply was regarded by the informant as safe and at only 106 was the water supply regarded by the users as either unsafe or questionable.

At 225 of the homes the source of water supply was downhill from and obviously exposed to surface drainage from insanitary privies, and in 136 cases the source of water supply was downhill from and exposed to drainage from stables.

The distance between the source of water supply and the privy at 113 homes was less than 50 feet; at 707 homes, between 50 and 100 feet; at 859 homes, over 100 feet. For the remaining sources of water supply the distance from the privy was not recorded.

In about 40 per cent of instances the wells or cisterns were protected to some degree from surface drainage by water-tight platforms. Of 1,472 homes at which the equipment for hoisting the water was recorded, at 977 the water was removed from the well or cistern by means of a pump, and at 495 buckets were used for the purpose.

Of the 1,452 wells in use, 1,155 were dug wells, 210 were bored, drilled, or driven wells, and for 87 wells the type was not recorded. The wells were protected to a reasonable degree by curbing against surface drainage in 798 instances; in 502 instances there was no curbing; and for 152 wells the presence or absence of curbing was not recorded. One thousand two hundred and eighty-one wells had casings to protect them to a greater or less degree from subsoil seepage, 63 had no casing, and for 108 the presence or absence of casing was not recorded.

According to the statements obtained, 9 of the wells were less than 10 feet deep; 203 were between 10 and 25 feet deep; 735 were between 25 and 50 feet deep; 274 between 50 and 100 feet; 6 were 100 feet or over; and for 225 wells the depth was not recorded.

Disposal of human excreta.—Of the rural dwellings, 25 had water-closets, 10 had both water-closets and privies, and 1,829 had privies only. There were, therefore, 35 water-closets and 1,839 privies found on premises in the rural sections of the county. For 34 homes no information was recorded as to the equipment for excreta disposal. At 364, or 16.34 per cent, of the homes there were no toilets of any kind, the members of these households resorting to stables, barns, or near-by woods to void their excretions.

Of the 1,839 privies in use, only 3 were of sanitary ("A") type, of fly-proof construction, equipped with water-tight receptacles, and kept by systematic cleaning in a sanitary condition. Of the remaining 1,836 privies, 16 were "B" type, being provided with water-tight receptacle to prevent soil pollution, but not screened against flies; 6 were "C" type, not provided with any vessel, but protected against invasion by flies; 497 were "D" type, having no vessel and no fly protection, but boarded up at the back to prevent access of animals to the contents; and 1,317 were grossly insanitary, open-back "E" type, polluting the soil and allowing flies and barnyard animals free access to their contents.

Of the homes equipped for the disposal of human excreta only with water-closets, at 13 the sewers discharged into insanitary cesspools, and at 12 the water-closet effluents were disposed of through septic tanks or by other means in a sanitary manner. Thus 12 of the homes with sewerage and 3 homes with sanitary privies constituted the 0.67 per cent of all the rural homes in the county which were found to be properly equipped with toilet facilities for sanitary disposal of human excreta.

The distance of the privy from the kitchen door at the different homes was as follows: For 170 homes, less than 50 feet; for 965, between 50 and 100 feet; for 704, over 100 feet.

Of the 1,864 homes at which there were privies or water-closets, or both, such toilets were used, according to the statements obtained, by all members of the household at 1,006 homes; by some, usually the women and children but not all the members of the household, at 614; by none of the members of the household at 104; and for 140 the extent of use of the toilet was not recorded.

At 1,366 of the homes chickens and other domestic animals had free access to privy contents and freely scattered the matter about the premises; and there was danger of the matter being carried by domestic animals, on the feet of persons, by surface washing or by subsoil seepage, to the water supply used for drinking purposes at 1,273 homes, to yards in which children played at 1,533 of the homes, to truck patches in which green vegetables, usually eaten uncooked, were cultivated at 1,461 homes, to grounds from which fruits were collected at 1,483 homes, and to all such places at 1,217 homes. For 347 homes there seemed to be no danger of privy contents being carried to any of the above-named parts of the premises, and for 55 homes no information was recorded on this point.

At 34 of the homes where privies were in use it was stated that the privies were cleaned when necessary. At 37 of the homes the privies were said to be cleaned daily, at 30 homes weekly, at 12 every two weeks, at 167 once every month, at 36 every two or three months, at 151 twice a year, at 325 once every year, at 31 every two or three years, at 564 never, and for 452 homes information on this point was not recorded. According to statements obtained privy contents when removed were disposed of as follows: At 631 homes buried, at 2 burned, and at 190 dumped on surface of the ground in near-by fields or woods.

Schools, churches, railroad stations, post offices.—The schools, churches, railroad stations, and post offices surveyed in the rural districts disclosed sanitary conditions comparable with those of the isolated country homes.

Sanitary rating.—At 2,072 of the rural dwellings a score was estimated and recorded on excreta disposal, water supply, screening, and general cleanliness. The average sanitary rating for these dwellings was 32.7 per cent.

County health administration.—There was no county organization for the administration of health affairs. About the only evidence of health activities by the county authorities was when the county physician was charged with the exercise of quarantine measures for an occasional case of smallpox.

FINDINGS IN TOWNS.

The findings in the seven incorporated towns and the village of Mosby are presented in detail in the following table:

Findings.	Incorporated towns.							Mosby.	Total homes.
	Liberty.	Excelsior Springs.	Smithville.	Kearney.	Missouri City.	North Kansas City.	Holt.		
Number houses inspected	759	709	215	199	108	92	82	20	2,184
Number of homes canvassed and surveyed	627	596	183	172	91	78	66	18	1,831
Number of homes occupied by owner	408	337	124	129	56	14	53	14	1,135
Number of homes occupied by tenant	219	259	59	43	35	64	13	4	696
Race of family:									
White	510	536	182	172	85	78	66	18	1,647
Negro	117	60	1	....	6	....	....	....	184
Duration of residence, head of household, in county:									
Less than 1 year	11	21	2	2	3	5	....	1	45
1 to 5 years	65	71	11	8	3	21	4	2	185
5 to 10 years	45	72	13	1	9	2	2	1	145
10 to 20 years	64	80	18	4	12	1	4	1	184
Over 20 years	442	352	139	157	64	49	56	13	1,272
Duration of residence, head of household, in home surveyed:									
Less than 1 year	93	141	26	19	10	15	7	5	316
1 to 5 years	203	228	60	62	34	5	26	9	627
5 to 10 years	143	118	35	26	14	44	9	1	390
10 to 20 years	109	85	43	41	10	3	16	3	310
Over 20 years	79	24	19	24	23	11	8	....	188
Number in household:									
1	28	30	14	16	9	1	3	....	101
2	161	149	53	47	23	20	16	5	474
3	176	131	40	48	23	20	15	1	454
4	126	104	35	29	12	13	21	6	346
5	57	74	20	12	14	9	4	1	191
6	36	44	12	9	4	3	2	3	113
7	20	33	4	7	4	5	3	1	77
8	13	9	1	1	....	4	....	1	29
9	4	8	3	1	1	....	2	....	19
10	....	7	....	1	....	3	....	....	11
11	4	3	1	1	....	....	....	....	9
12	1	2	....	....	....	....	....	....	3
Over 12	1	2	....	....	1	....	....	....	4
Stock on premises:									
All	....	1	....	1	....	2	6	....	10
None	266	503	74	64	57	....	17	5	986
Cows	23	13	15	14	3	3	15	4	90
Horses	32	34	21	24	3	7	15	3	139
Poultry	191	119	74	97	43	24	57	14	619
Hogs	14	4	4	7	1	2	7	1	40
Dogs	90	77	34	23	13	14	20	2	273
Cats	100	32	39	22	13	14	14	1	235
General appearance of dwelling:									
Good	440	398	132	87	36	68	26	8	1,105
Fair	305	253	78	106	55	9	53	12	871
Poor	14	58	5	6	17	15	3	....	118
Construction of house:									
Frame	693	656	210	197	104	92	80	20	2,052
Brick	51	27	2	2	4	....	2	....	88
Stone	1	14	1	....	....	....	....	....	16
Stucco	7	8	....	....	....	....	....	....	15

Findings.	Incorporated towns.							Mosby.	Total homes.
	Liberty.	Excelsior Springs.	Smithville.	Kearney.	Missouri City.	North Kansas City.	Holt.		
onstruction of house—Con.									
Cement	1								1
Brick and frame	5	1							6
Stone and frame	1	3	2						6
umber of rooms in house:									
1	1	3	1	5	3			1	14
2	25	13	5	1	6	3			53
3	78	50	17	12	18	9	9	4	197
4	123	123	39	42	30	19	14	4	394
5	155	130	70	64	20	43	21	8	511
6	96	165	40	41	14	11	17	2	386
7	64	79	16	16	5	6	11		197
8	129	73	16	6	6	1	10		241
9	26	17	2	2	2				49
10	30	25	8	6	2				71
11	7	4	1	2	1				15
12	16	13			1				30
Over 12 rooms	9	14		2				1	26
eneral cleanliness:									
Good	440	426	134	96	36	66	36	7	1,241
Fair	281	209	72	95	61	12	39	13	782
Poor	38	74	9	8	11	14	7		161
ellar:									
Houses with	417	430	54	25	20	66	9	2	1,023
Houses without	342	279	161	174	88	26	73	18	1,161
creening in summer:									
Complete	353	553	190	160	77	60	70	18	1,481
Partial	77	118	19	28	17	19	9	1	288
None	329	38	6	11	14	13	3	1	415
ater supply:									
Source—									
Public (piped) system	476	496			10	71			1,053
Private supplies—									
Wells	195	178	157	163	37	20	77	15	842
Cisterns	86	21	39	28	51	1	5	1	232
Springs	2	16			3				21
None on premises	14		22						36
ells:									
Type—									
Dug	149	116	132	123	11	10	73	5	619
Bored	6	26	21	28	19	5	1	10	116
Not stated	40	36	4	12	7	5	3		107
Protection—									
With good casing	88	28	19	30	6	5	2	9	187
With good curbing	55	74	86	79	10	4	30	12	350
Equipment—									
With buckets	109	65	13	33	15	7	4	3	249
With pumps	86	113	144	130	22	8	72	12	587
Not stated									6
Depth of wells in feet—									
0 to 50	57	174	153	150	33	15	68	13	663
50 to 100	131	4	4	13	4		9	2	167
100 or over	7								7
Not stated									5
Drainage toward—									
From privy	4	42	22	10	4	1	2		85
From stable	5	74	5	6		5			95
Distance from privy—									
0 to 50 feet	41	57	50	22	19	3	17		209
50 to 100 feet	120	94	97	117	16	7	56	13	520
100 feet or more	34	27	10	24	2	5	4	2	108
Not stated									5
prings:									
Protected from surface drainage by—									
Curbing		1							1
Walling	2	1							1
Ditching					2				2
Water obtained by:									
Piping	1	1			2				4
Dipping	1	15			1				17
Drainage toward, from privy		1							1
Distance from privy, 100 feet or more	2	16			3				21
isterns:									
Water-tight	51	11	4	17	13	1	3		100
Not water-tight	35	10	35	11	38		2	1	132

Findings.	Incorporated towns.							Mosby.	Total homes.
	Liberty.	Excelsior Springs.	Smithville.	Kearney.	Missouri City.	North Kansas City.	Holt.		
Private water supplies regarded as safe:									
By person interviewed...	249	151	138	150	84	17	61	16	866
By investigator..........	110	26	52	47	31	3	20	9	298
Excreta disposal:									
Number of homes with—									
Privies..............	414	281	189	196	100	23	80	19	1,302
Water-closets........	285	415	19	2	....	66	1	....	788
Both water-closets and privies........	55	3	5	....	....	....	....	....	63
Without toilets of any kind..........	5	10	2	1	8	3	1	1	31
Effluent from water-closet discharged:									
Into city sewer..........	310	358	2	....	....	66	....	....	736
Into septic tank.........	....	2	....	....	....	....	....	....	2
Into cesspool............	10	14	2	....	....	....	1	....	27
On surface of ground or into creek..............	20	44	20	2	....	....	....	....	86
Type of privies:									
A.......................	3	8	1	....	....	....	....	....	12
B.......................	6	25	1	....	....	....	....	....	32
C.......................	9	32	5	....	....	....	2	....	48
D.......................	339	138	136	87	70	9	61	11	851
E.......................	112	81	51	109	30	14	17	8	422
Distance of privy from kitchen door:									
0 to 50 feet.............	6	80	50	30	30	1	21	....	218
50 to 100 feet...........	450	176	137	135	63	21	55	19	1,056
100 feet or more.........	13	28	7	31	7	1	4	4	91
Privy contents removed:									
Once a week..............	3	75	8	4	....	....	1	1	92
Once in two weeks......	2	1	10	3	....	4	4	....	24
Once a month............	12	8	16	12	1	8	10	3	70
Once in six months......	324	33	63	69	24	6	24	3	546
Once a year.............	119	135	68	82	38	3	32	12	489
Never...................	9	32	29	26	37	2	9	....	144
Removal of privy contents:									
By public scavenger.....	346	143	50	12	4	....	....	....	555
By household............	114	109	115	158	59	21	71	19	666
Final disposal privy contents:									
Buried..................	32	105	72	99	41	8	53	15	425
Burned..................	27	....	....	....	....	....	....	....	27
Dumped in woods or fields, or scattered by drainage, seepage, or animals...........	410	179	122	97	59	15	27	4	913
Average sanitary rating of homes....	58.9	67.2	44.2	35.7	35.9	72.9	38.3	35.6	48.6

The public water supplies of Excelsior Springs and Liberty were examined, and they appeared—from the field studies, from the construction of the wells in the flats near the Missouri River, from which they were obtained, and from the results of bacteriological examinations—to be of good sanitary quality.

The majority of the wells, springs, and cisterns in the towns used by families as private sources of water supply were obviously exposed to pollution, and on bacteriological examination the water from them was found to contain colon bacilli.

The mineral wells in Excelsior Springs were all bored wells with steel casings, and most of them tapped water-bearing strata of considerable depth and below one or more strata impervious to water. Samples from 17 of these mineral wells were sent to the laboratory of the State board of health for bacteriological examination, and all of them in quantities of 10 cubic centimeters were reported to be free from colon bacilli.

At several of the mineral wells, patronized extensively by the public, public drinking cups were found in free use.

The public sewerage systems in Liberty, Excelsior Springs, and North Kansas City were apparently good as far as they went. The main sanitary faults with each of the incorporated centers in the county were the numerous insanitary privies with their contents exposed to flies, polluting the soil extensively—in many instances in proximity to exposed sources of private water supplies—and being scattered about by drainage, by barnyard animals, and by the feet of persons.

Of the 788 town dwellings equipped for the disposal of human excreta only with water-closets the disposal of water-closet effluents was through sanitary sewerage systems, public or private, for 738.

Of the 1,365 dwellings with privies constituting the principal or the only toilet facilities only 12 were equipped with privies of sanitary type.

Thus of the 2,184 town homes 750, or 34.34 per cent, were properly equipped for sanitary disposal of human excreta.

TYPHOID FEVER PREVALENCE.

The records of cases of and deaths from typhoid fever for the years previous to that of the survey were obviously incomplete.

The number of deaths from typhoid fever recorded for Clay County in 1914 was five. This, which probably was about the annual average, would give the county a typhoid fever death rate of about 24 per 100,000 of population.

Of 7,429 persons canvassed in 1,830 country homes 417, or 5.4 per cent, gave a history of having had typhoid fever. In this number 31, it was stated, had the attack in 1915.

GENERAL MORBIDITY.

Of the 7,429 persons canvassed in 1,430 of the rural homes 89, or 1.19 per cent, were recorded as definitely ill at the time of the visit to the home. The distribution of these cases of illness according to age and sex of persons affected was as follows:

Age in years.	Number of persons ill.			Age in years.	Number of persons ill.		
	Male.	Female.	Total.		Male.	Female.	Total.
0 to 5	5	5	10	40 to 50	4	1	5
5 to 10	1	3	4	50 to 60	4	10	14
10 to 15	2	1	3	60 to 70	9	3	12
15 to 20	....	4	4	70 to 80	8	5	13
20 to 30	3	5	8				
30 to 40	3	13	16	Total	39	50	89

SANITARY MEASURES RECOMMENDED.

For the country homes the measures especially recommended were (1) the installation of sanitary sewerage systems or sanitary privies, (2) improved protection of sources of water supply, (3) scattering of stable manure every week or keeping it in fly-proof bins to prevent it from serving as a breeding place for flies, and (4) the prompt adoption of bedside precautions in cases of typhoid fever or of other infectious diseases.

On account of the small proportion of families in reduced financial circumstances, high-grade devices for the sanitary disposal of human excreta were generally recommended, and seldom was the Mosaic method suggested except as a temporary expedient. A large majority of the dwellings were well screened to exclude flies; screening of dining rooms and kitchens generally did not have to be stressed.

For the towns generally the immediate installation of sanitary privy systems was recommended. For those with public water supplies and sewerage systems the extension of such systems, with the abolishment of contaminated private sources of water supply and of privies as rapidly as practicable, was recommended.

Immediately after the completion of the detailed survey of each town a written report of findings, with specific recommendations, including drafts of such additional ordinances as appeared needed, was submitted to the town council. These reports, with the approval of the town councils, were published in the local newspapers, so the public would be informed about the sanitary measures needed in the community.

As a campaign was being organized by the State board of health for legislation to divide the State into sanitary districts, with a whole-time health officer in each, the importance of establishing an office of whole-time county health officer was not emphasized.

COOPERATION.

Good cooperation in the work was obtained from the State board of health, the local physicians and the clergymen, the town officials, the local newspapers, the business and civic organizations, and from many prominent individual citizens.

The State board of health furnished one of the members of the force for the detailed work of the survey from August 1 to November 21. The president of the State board, a resident of the county, gave the work his strong support. He attended and addressed a number of the public-health meetings. He was in constant touch with the work and gave the officers of the survey much valuable advice about local conditions. In his capacity as president of the State board of health and as a local physician and citizen his support of the work was very effective.

All of the town councils adopted the sanitary ordinances suggested and enforced them with more or less vigor.

The local newspapers gave the survey excellent and extensive publicity and strongly supported, editorially, the program of sanitation recommended. The Kansas City Star published several elaborate accounts of the work. One of the articles appearing in a Sunday issue of this paper gave, with illustrations, an account of the work in detail, written by one of the regular city reporters who had spent a whole day visiting homes with members of the survey force to make observations of the work.

The town officials and commercial club of Excelsior Springs, appreciating the peculiar advantages, from even a strictly business standpoint, of high-grade sanitary conditions for their town, gave the work their strong support throughout the period of the survey. Immediately following the opening health talk at Excelsior Springs, the mayor of the town engaged four sanitary inspectors to inspect all premises and to serve notices wherever indicated for correction of conditions. As a result of this, in view of the short interval of a few days before the regular survey was begun in the town, much was accomplished in the way of removal of stable manure and rubbish and in getting orders filed for sanitary plumbing. The town council appropriated $2,000 and the Excelsior Springs Commercial Club raised $4,000 to finance the preparations for the Clay County sanitation celebration.

CLAY COUNTY SANITATION DAY.

October 21, 1916, was designated as "Clay County sanitation day," for the urpose of celebrating the advancement in sanitation in the county during the eriod of the sanitary survey. The movement for the celebration was inugurated by the commercial club of Excelsior Springs, and the preparations or it were financed mainly by this organization and by the town council of xcelsior Springs. Elaborate preparations were made, under the direction of rominent citizens of Excelsior Springs and of other parts of the county, serving as members of the different committees designated as the committees on parade," "decoration," "county cooperation," "transportation," "music," finance," "speaking," "floats," "county school cooperation," "publicity," entertainment," "reception," and "civic sanitary improvement." The day as declared a county holiday, and schools and other places, the business of hich would permit, were closed in order that all might attend the occasion. he celebration was held in Excelsior Springs. The town was clean to a degree o suit the occasion, and was handsomely decorated. Thousands of visitors rom different parts of the county and from more distant parts were present. mong the visitors, who was one of the public speakers for the occasion, was urg. J. W. Trask, then Assistant Surgeon General of the Public Health Servce. The general plan of the celebration was similar to and some of its eatures, including the parade, were even more elaborate than the celebration t Fredonia, in Wilson County, Kans., in 1915. Representatives of the Assoiated Press and of the Pathe Moving Picture Corporation were present. hrough them the celebration was given extensive and highly favorable publicty. The moving-picture reel, made of the more salient features of the parade, as subsequently shown as one of the topics of the Pathe Illustrated Weekly in housands of moving-picture theatres in the United States.

RESULTS.

Country homes.—Groups of representative country homes in different neighorhoods were revisited to ascertain the degree of sanitary improvement acomplished subsequent to the first visit of the survey. The aggregate number f homes in these groups was 500.

At 78, or 15.6 per cent, marked improvement in methods of excreta disposal, ncluding use of better types of privies, had been effected. Included with these 8 homes were 48, or 9.6 per cent, of the 500 homes, at which high-grade sanitary rivies with water-tight receptacles and of fly-proof construction, had been nstalled in the place of grossly insanitary open privies.

Besides the improvement in methods of excreta disposal, considerable progress ad been made in the protection of water supplies and in general cleanliness of remises.

At 4.6 per cent of the homes of the county polluted sources of water supply ad been improved so that in the opinion of the investigator the water therefrom as safe.

At 36, or 7.2 per cent, of the homes the screening had been improved from artial to complete.

Kearney, Missouri City, Mosby, and Holt.—In each of these small incororated towns an ordinance requiring all privies to be made of sanitary type as adopted by the town council, but was in each instance only indifferently nforced. The difficulty anticipated by the town councils was in the mainteance of a systematic scavenger service to clean the cans used in the sanitary rivy system contemplated in the ordinances. From the observations in these and other small towns it was learned that the large cement double-compartmented vault is preferable to the can type of sanitary privy for towns with an insufficient number of privies to keep at least one man steadily engaged in the scavenger work.

In Kearney the town council purchased and stored for use in making the privies of sanitary type 50 cans, but on the last round of survey of the town it was found that only 8 of the cans had been installed and only 4 of the 196 insanitary privies in Kearney had been converted into strictly sanitary type.

In Missouri City, a coal-mining settlement with a large proportion of the dwellings owned by the company operating the coal mine, very little progress was made. On the last round of survey of this town only 4 of the 100 insanitary privies were found to have been converted into sanitary type.

In Holt also little progress was made. Of the 80 insanitary privies in this town only 2 were found on the last round of survey to have been converted into sanitary type.

In Mosby it was found on the last round of survey that at 10 of the 20 dwellings in this town sanitary privies had been installed in the place of insanitary privies, and the work was in progress with good prospects for eventual completion.

North Kansas City.—Here sewer extensions were being made so that all of the 23 privies could be abolished and replaced with water-closets. Therefore, the adoption and enforcement of an ordinance providing for a sanitary privy system had not been recommended.

Smithville.—Of the 195 dwellings at which on the first round of survey grossly insanitary privies had been found 180, or 92.3 per cent, were found on the last round of survey to be provided with high-grade sanitary privies. (fig. 59). The work of installing sanitary privies was in progress and the prospects for completion at an early date appeared good. An adequate scavenger service had been established and the sanitary privies were being kept in good condition. Thus this town set a good example in sanitary progress. The best results in the country neighborhoods were in the rural section in the immediate vicinity of Smithville.

Liberty.—The ordinance requiring all privies in Liberty to be made of sanitary type was adopted by the town council on August 25 and became effective on September 25. The work of installing sanitary boxes and cans in the privies was not carried forward very vigorously, but by the last of November about 150 of the insanitary privies had been converted into sanitary type, and in addition to these about 50 had been abolished and water-closets connected with the extended sanitary sewer installed in their stead. Thus about 200, or 42.9 per cent, of the insanitary privies in this town had been replaced with properly appointed sanitary devices. An adequate scavenger service had been established and contents of all privies were being removed systematically and disposed of in a sanitary manner. Radical extension of the sewerage system, involving an expenditure by the city of $18,000, was in progress when the survey terminated November 21.

Excelsior Springs.—The town council of Excelsior Springs on August 31 adopted an ordinance, to be effective September 25, requiring all dwellings within the corporate limits of the town to be provided with either sanitary privies or with sanitary water-closets properly connected with the sanitary sewerage system. On the recommendation of the officer in immediate charge of the survey and in order to have the work of installation carried forward more vigorously, the town council on October 5 authorized the local board of health

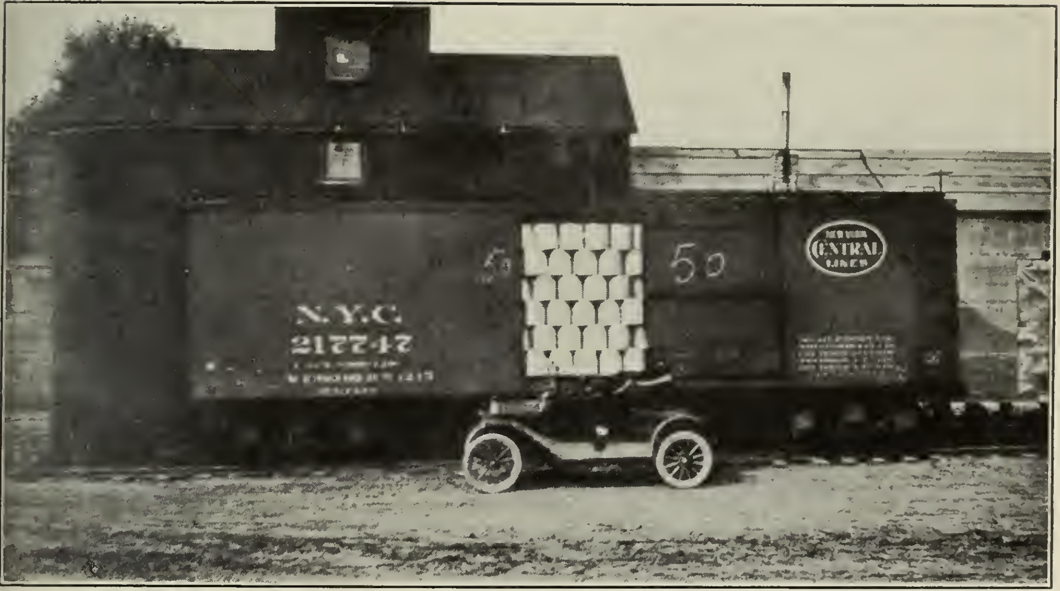


Fig. 59.—Cans arriving for use in sanitary privies in one of the towns in Clay County, Mo.

to order and to have installed at the expense of the property owners the sanitary boxes in all privies which had not already been made to conform to the terms of the sanitary ordinance. The property owners, with practically no exceptions, were agreeable to this arrangement. The work was done at wholesale rates and on record time. A large force of carpenters was engaged to make and install the boxes, and on October 19, when a close resurvey of the town was made, only 24 of the 276 insanitary privies found on the first survey were found to remain of insanitary type. The sewerage system was being extended rapidly, but even at dwellings to which the sewer would be laid and at which water-closets would be installed within the 30 days following the privies were converted into sanitary type. The whole community was imbued with the idea of having Excelsior Springs make as high a sanitary rating as possible before the sanitation celebration, to be held October 21. From the sanitary privies, in use but a short time and then replaced with water-closets, the sanitary boxes and cans were sold at less than cost to householders living in unsewered rural districts in the vicinity. An adequate municipal scavenger service was established to keep the privies clean and to dispose of their contents through the sewerage system in a highly sanitary manner.

On October 5 the town council adopted an ordinance requiring a discontinuance of the use in the town of public drinking cups. This ordinance was declared effective immediately and was rigidly enforced.

When the survey terminated, November 21, Excelsior Springs, as a whole, presented an exceptionally good demonstration in urban sanitation. An adequate and efficient force of sanitary inspectors was on duty under the personal supervision of the mayor; the ordinances requiring the sanitary storage, collection, and disposal of stable manure, garbage, and other refuse were being well enforced; over 96 per cent of all the dwellings in the town were equipped with proper devices for the sanitary disposal of human excreta; and the town in all other respects was in exceptionally good sanitary condition.

On the completion of the first round of survey of the town, the mayor was given a map of the town, with every dwelling having an insanitary water-closet or an insanitary privy indicated by a red spot. He was told that on the subsequent surveys as the conditions were found to be corrected the progress would be indicated on the map by the number of red spots having green circles around them.

That the sanitary work in Excelsior Springs made progress after the survey had been terminated is shown by the following letter received by the officer who had been in immediate charge of the survey of Clay County:

EXCELSIOR SPRINGS, MO.,
December 22, 1916.

DR. H. C. YARBROUGH,
U. S. Marine Hospital, Chicago, Ill.

DEAR SIR: We are returning, under separate cover, the two parts of maps and the one entire sanitary map on which are your "red spots." You will note that practically all the spots have green rings around them, indicating abatement of bad condition. Explanations have also been written in.

As soon as your final inspection notes were received our health officer started checking and enforcing compliance with your recommendations. A special effort has been made to compel connections with the new sewers constructed. The work has gone on steadily and we are much pleased with results. Where sewer connections could not be made your "A" type of water-closet (privy) had been installed, with the exception of five houses which are in sewer districts where sewer is now complete; in each of these instances notice has been served and promises definitely given that connections will be made as soon as weather will permit.

We call your attention to the fact that the following sewer lines have been constructed, are under construction, or contracted—all since you commenced your sanitary survey. These sewer lines are as follows:

	Feet.
East of Main Street, in Lincoln School neighborhood	1,180
Northern addition	602
Kennedy Avenue	1,753
Sunnyside addition	4,078
Farris Avenue	752
Total	8,365

Your suggestion regarding the disposal of the can contents from water-closets (privies) has been carried out. A small building, 8 by 10 feet, heated by stoves, has been erected over the manhole at south end of Marietta Street and a water connection brought into the building for flushing. The collection and disposition of the matter from water-closets (privies) has been going on regularly once each week, notwithstanding the extreme cold weather. We are indebted to you for the suggestion, as it has enabled us to hold our city scavenger by giving him a fairly comfortable and satisfactory way of completing a most disagreeable job.

We are gratified at the number of connections made in the new sewer districts, where, under your direction, type "A" closets already had been installed.

We anticipated trouble in rounding up some of the people whose names were mentioned in your final inspection report, but the contrary has been the case. They have almost uniformly responded promptly and willingly to the demands of the health officer. The only exceptions are two persons, and they will be brought into court.

You will also find inclosed an account and explanatory plat of our water system, as you requested.

We also wish to thank you again for your intelligent and energetic assistance in enabling us not only to make our town sanitary but to definitely educate the public sentiment in our community, which we believe will enable us to keep it healthy in the future.

Very sincerely, yours,

(Signed) S. J. Rowell,
Mayor City of Excelsior Springs, Mo.
(Signed) W. D. Flack,
Sanitary Officer.

Summary of results in towns.—Of the 1,356 town dwellings which at the beginning of the survey were provided with insanitary toilets, 652, or 48.09 per cent, by the end of the survey period had been equipped with sanitary toilets with sanitary disposal of contents.

In addition to this improvement, within the period of the survey marked progress was made at the town homes in screening, general cleanliness, water supplies used, and in other matters for the protection of the health of the citizens.

Typhoid-fever reduction.—Unfortunately the lack of complete records for previous years prevents an accurate comparison of typhoid rates for the periods before and after that of the survey. According to such evidence as could be obtained, however, there appeared to be some reduction in the typhoid rate as an immediate result of the survey. Thus, record was obtained of 8 cases in the period July 1 to December 1 of 1916, as against a record of 18 cases in the corresponding period of 1915.

CONCLUSION.

As an immediate result of the survey a reasonably good demonstration in sanitation of both town and strictly rural communities was accomplished in Clay County.

If a reasonably adequate local health organization were furnished by either the State or the county to continue the work begun in 1916, there is no reason to doubt that Clay County, Mo., as a whole would soon attain a high standard of sanitation.

SANITARY SURVEY OF CUMBERLAND COUNTY, ILL.

In response to a request from the State board of health the rural sanitary survey of the Public Health Service was extended to a county in Illinois in 1916. As special inducements for the survey to be extended to a sixth county in that year, the Illinois Board of Health agreed to furnish two of the men for the force to be engaged on the detailed work of the survey and designated for the survey one of the counties of comparatively small area.

Cumberland County, the one designated, was said to offer fairly representative conditions of the rural counties in the southern half of Illinois. The counties in the southern half of the State were of particular interest from a standpoint of sanitation because, according to such records as were available, the typhoid-fever rate of prevalence appeared to be much higher in the rural sections of that half than in those of the northern half of the State.

The sanitary survey of Cumberland County was begun August 15, 1916, and terminated December 4, 1916.

GENERAL CONDITIONS.

Cumberland County lies between the thirty-ninth and the fortieth parallels of latitude and the eighty-eighth and the eighty-ninth meridians of longitude, and thus is located in the south-central part of the State of Illinois. It is immediately south of what is known as the " black lands " or " the corn belt " of Illinois.

The topography of the county is generally rolling, with several valleys cut through it by creeks which empty into the Embarras River. The course of the Embarras River is across the eastern section of the county from north to south. This river is usually shallow and slow running, but at times, especially during the spring rains, it overflows its banks and floods a section of about one-half mile wide along its course.

The soil formation of the county generally is black loam and sandy loam, but with sand and clay mixtures in some sections. The water-bearing stratum is sandstone, and this in most parts of the county is from 20 to 30 feet below the surface. This stratum yields an abundant supply of water even in the dry season. The water has a high mineral content, consisting largely of chlorides, which makes the water hard and unsatisfactory for laundry purposes. In consequence, cistern water is used to a great extent in the county for laundry purposes. About 200 feet below the ground surface is a water-bearing stratum containing an abundance of water which is more heavily charged with salts than that from the superficial water-bearing stratum. At the time of the survey there were two artesian wells in the county which tapped this stratum. Both of them were in Greenup Township.

According to the census reports the population of the county, in 1910, was 14,281, of which all except 7 were white. It appears that this one family of negroes had moved away before 1916, because in the course of the sanitary survey all homes found were occupied by white persons. The population in the decade 1900–1910 decreased 11.4 per cent and in the decade 1890–1900 increased 4.4 per cent. The county is distinctly rural. None of the towns had a population of as much as 2,500. There are in the county four incorporated villages, with populations (in 1910) as follows: Greenup with 1,224, Neoga with 1,074, Toledo with 900, and Jewett with 366.

The land area is 353 square miles. In 1910 the population per square mile was 40.5—all rural. Native whites of native parentage constituted 94.6 per cent of the population, native whites of foreign or mixed parentage constituted 4.5 per cent, and foreign born constituted only 0.9 per cent. Of persons 10 years old and over, 2.8 per cent were recorded as illiterate.

With the exception of the work at several oil wells located within an area of about 2 square miles in the northeastern section of the county the industries are distinctly agricultural. The incorporated villages are farm community centers. Indian corn, broom corn, and hay are the principal crops. Poultry and eggs are produced on quite a large scale. Dairying is engaged in to a considerable extent. Cream is shipped to central depots in other counties, there made up into butter which is shipped to the markets in the Middle West and Eastern States.

According to the census reports, the number of farms in Cumberland County in 1910 was 2,264. Of the land area, 91.1 per cent were in farms with 90.5 per cent improved. The average acres per farm were 90.9, of which 82.2 acres were improved.

The value of all farm property was given as $15,828,183. The value of land per acre was given as $56.95. Of all the farms 71.3 per cent were operated by owners and 27.8 per cent by tenants.

Thus, this county, with good economic conditions and a home-owning, independent rural population, offered a fair field for a study of progress in sanitation for the protection of the health of the families.

The county has fairly good railroad facilities. The wagon roads are laid out along the section lines and are at right angles to each other, there being very few diagonal roads. They were in poor condition; the only improvement found was grading. In dry weather they were dusty and rough and during the rainy season they often became almost impassable. In 1916 the road commissioner was making an effort to repair some of the old dilapidated bridges and to build good concrete ones in the places of some of them.

The county government was administered by a board of supervisors consisting of eight men, one elected from each of the eight townships into which the county is divided. Each supervisor acted as health officer for his township and in addition to his other duties cared for his township's poor. Besides the enforcement of quarantine measures for an occasional case of smallpox there was found no evidence of health activities by the county officials.

In each of the incorporated villages the local government was under a village board consisting of six trustees and a president. The administration of health affairs in a very general way rested with the board of trustees. None of the villages had a sanitary officer.

PLAN AND SCOPE OF SANITARY SURVEY.

The plan of work in this county was the same as that followed in the surveys of other counties in 1916.

The work comprised (1) a canvass and a sanitary survey of all homes in the county; (2) a survey of 77 schools, 58 churches, 8 railroad stations, 152 stores, and 8 post offices; (3) public addresses on the subject of sanitation, usually with lantern-slide illustrations, in all sections of the county; (4) the preparation of written reports of findings for the councils of the incorporated villages; (5) the distribution of literature on appropriate phases of the subject of sanitation, and (6) the epidemiologic investigation of cases of typhoid fever as they occurred.

The force engaged in the detailed work of the survey consisted of two officers detailed by the State board of health and officers of the Public Health Service. The number and the duration of service of the latter in this county in the period of the survey were as follows:

One from August 7 to August 15.
One from August 7 to December 4.
One from August 15 to December 2.
One from August 18 to December 4.
Two from August 15 to October 1.
One from October 1 to November 28.
One from October 4 to December 4.

The preliminary meetings in the county to explain the plan and purpose of the work to the citizens were largely attended and were addressed by the officer in general charge of rural-sanitation studies of the Public Health Service and by the sanitary engineer of the State board of health.

In the course of the survey a meeting for a health lecture was held in every section of the county. All told, 53 public lectures were given to audiences averaging about 70 persons. Thus, besides the talks made to individuals in the course of the house-to-house surveys, about 3,700 persons in the county heard and saw explained at public meetings the facts of sanitation.

Headquarters were established in the county courthouse at Toledo. The survey was conducted by townships—two of the men being assigned to each of the townships, and, as a rule, living in the township until the survey of it was completed. If the township comprised one of the incorporated villages, the survey of the village was made first. As soon as the survey of the village was completed, a report of findings with recommendations for sanitary improvements needed was made to the village board of trustees.

The total number of homes surveyed in the county was 3,298. Of these, 2,378 were strictly country homes and 920 were located in the four incorporated villages.

After the first round of survey was completed 1,192 country homes and practically all of the town homes were revisited, to ascertain the degree of sanitary improvement accomplished for the county, as a whole, subsequent to the first round of survey.

FINDINGS AT FARM HOMES.

The more salient features among the findings at the 2,378 country dwellings were tabulated and were as follows:

Race.—In every occupied dwelling visited the occupants were white, and over 99 per cent of the population canvassed were recorded as American born.

Number in household.—The number of persons in 2,066 occupied dwellings at which the number in the household was enumerated was 8,897. Thus the average for each household was 4.3. The dwelling houses generally had from 4 to 8 rooms, and evidence of crowding was very exceptional.

Screening in summer.—At 1,708 of the dwellings the screening of dining room and kitchen was complete, at 419 the screening of dining room and kitchen was incomplete, serving as a means to exclude probably half the flies seeking admission; at 241, or 10.18 per cent of the dwellings, there was no screening of the dining room and kitchen, and for 10 of the dwellings the presence or absence of screening was not recorded. Thus it appeared that the vast majority of the citizens of the county had realized the advantage of keeping flies out of their kitchens and dining rooms. But in regard to the prevention of fly breeding, little had been done. On practically all of the farms stock, including horses, cows, etc., was stabled, and at none was adequate provision found for the prevention of fly breeding in stable manure. At a few fly breeding was incidentally controlled to some extent by frequent removal and spreading of the manure for fertilization of the fields.

Water supply.—At the farm homes 2,235 wells, 242 cisterns, and 18 springs were found in use as sources of water for drinking and other domestic purposes. The average distance of the principal source of water supply from the privy was 92 feet. The average depth of the wells was 22 feet. None of the springs was well protected against surface drainage. Most of the cisterns appeared to be of good construction with water-tight walls, but 31 of them were "seep cisterns" in dangerous proximity to insanitary privies. Eight hundred and fifty of the wells or cisterns were protected to a good degree against surface drainage by waterproof curbing and tight platforms. For hoisting the water from the well or cistern, pumps were in use at 1,593 of the 2,066 occupied dwellings, at which water was obtained from wells and cisterns, and buckets were in use for this purpose at the remainder (473). Of 2,213 of the wells of which the character of the casing was ascertained, the casing was brick in 1.533, stone in 575, terra cotta in 66, iron in 25, cement in 12, and wood in 2. Of all these wells the casing appeared to be water-tight so as to protect the water from pollution by seepage for 141. The protection of the water supplies about the top of the wells and cisterns and the equipment for lifting the water were found in this county to be exceptionally good. The investigators regarded as safe the sources of the water used at about 45 per cent of the homes.

Disposal of human excreta.—None of the farm dwellings was equipped with sanitary water-carriage sewer systems; 1,817 were provided with privies, and at 561, or 23.59 per cent, there were no toilets of any kind—stables, barns, and woods being used as places for the direct deposit of human excreta.

Of the 1,817 privies, only 4 were of sanitary ("A") type, provided with water-tight receptacles and of fly-proof construction; 3 were "B" type, provided with water-tight receptacles, but not fly proof; 8 were "C" type, screened against flies, but not provided with receptacles; 668 were "D" type, neither provided with water-tight receptacles nor of fly-proof construction, but boarded up at the back and sides so as to exclude chickens and larger animals from gaining access to the excreta (most of these were "pit" privies); and 1,134 were open-back privies ("E" type), with contents exposed to flies and all other predatory animals, including chickens especially on the premises. Thus, of the 2,378 country homes, only 4, or 0.17 per cent, were equipped for the sanitary disposal of human excreta.

The disposal of privy contents was generally infrequent, and its method, from a sanitary standpoint, grossly faulty.

Sanitary rating.—Scored on disposal of human excreta with a possible maximum of 50, water supply with a possible maximum of 30, screening with a possible maximum of 10, and general cleanliness with a possible maximum of 10, the average sanitary rating of the 2,378 homes was 39.82 per cent.

Public places.—The findings at schools, churches, stores, and post offices were generally similar to or of somewhat lower sanitary grade than those at the farm homes. Progress at the schools, however, was being started under a State law which had just become effective. This law provided that schools should be made to comply with certain definitely specified requirements in respect to toilet facilities, water supplies, and heating and lighting or else be deprived of the State appropriation for maintenance.

FINDINGS IN INCORPORATED VILLAGES.

For the 920 dwellings surveyed in the four incorporated villages, the general sanitary conditions averaged about the same as those found at the farm homes. Scored on disposal of human excreta, water supply, screening, and general cleanliness, the average sanitary ratings for the four villages were as follows:

Village.	Number of dwellings.	Average sanitary rating (per cent).
Toledo	232	38.75
Greenup	312	44.98
Neoga	304	48.40
Jewett	72	31.60

The factor of population density made the insanitary conditions in these villages a relatively much greater menace to the health of the community than did similarly insantiary conditions at an equal number of dwellings in the country neighborhoods.

On the most salient feature of sanitation, viz, cleanly disposal of human excreta, all of the villages were seriously lacking.

Of the 920 village dwellings, 26 were equipped with water-closets, 858 with privies, and 36 with neither water-closet nor privy. From none of the water-closets was the effluent disposed of in a sanitary manner. Of the 858 privies, only 1 was of sanitary type; 16 were of "B" type, 46 of "C" type, 562 of "D" type, and 233 of "E" type. Thus, only 1, or 0.10 per cent, of the 920 village dwellings was equipped for the sanitary disposal of human excreta.

In none of the villages was an adequate municipal scavenger service maintained, and in all of them the removal and disposal of privy contents, being left largely to individual initiative, was infrequent in time and grossly faulty in method.

Of the 920 village dwellings, the dining room and kitchen was completely screened at 789, incomplete at 91, and without screening at 40.

Toledo.—Besides its residences, this village had a business district comprising about 25 stores, grouped on the four streets surrounding the courthouse square.

Toledo was found to be without a public (piped) water supply or sewerage system. An attempt had been made a few years before to obtain a public water supply by damming a ravine in the northeast section of the village. This supply was found to be inadequate, owing to a too limited watershed, and it was decided to use a public bored well on the village square in conjunction with this supply. This project, however, had not been carried out, and at the time of the survey the village was furnished with water from the one public well, equipped with a pump, and from 219 private sources of supply. The private sources of supply consisted of 204 wells and 15 cisterns. The average distance of source of water supply from insanitary privies was 94 feet. Almost all of the wells were dug wells, cased with brick or stone, and about 60 per cent of them had poor protection about the top by curbing and platforms. The average depth of the wells was 22 feet; 198 were equipped with pumps and the remainder with buckets; 10 of the cisterns appeared to be water-tight and 5 of them to seep.

Three or four of the homes, one of which was used as a private hospital, had private sewerage systems. The sewage was passed through a cement-walled cesspool and thence into a storm sewer, which discharged into an open ditch on one of the principal streets. The types of the 228 privies found were as follows: B, 2; C, 8; D, 140; and E, 78.

Greenup.—Greenup was found to have a public water supply, obtained from the Embarras River and distributed without purification. The river water above the intake was obviously polluted and fequently was highly turbid. A part of the village located on hills rising from the bank of the river drained into the river above the intake for the water supply. On account of the turbidity of the public supply, most of the families used water from other sources. A good many used water from two artesian wells in the central part of the village. Two hundred and forty-three private sources of water supply were found in use. These consisted of 1 spring, 23 cisterns, and 239 wells. Of these wells 42 were equipped with buckets and the remainder with pumps; the average depth was 20 feet, and the average distance from an insanitary privy 93 feet; almost all were dug wells cased with brick or stone, and the majority did not have good protection about the top by curbing and tight platforms.

Seventeen dwellings had water closets connected with a sewer line which discharged into an open ditch in the western edge of the village. Of 280 privies found, 4 were B type, 1 C type, 211 D type, and 64 E type.

Neoga.—The business section covered 5 blocks and comprised about 40 stores. Neoga had a public water supply obtained from a shallow well in the eastern section of the village This well was 15 feet in depth and 15 feet in diameter. The supply of water yielded by it was abundant, but, owing to numerous insanitary privies in the immediate vicinity of the well, the water was of very dubious sanitary quality. The well was protected from surface drainage by concrete top and curbing. The casing was of brick and was not water-tight. The water, without being subjected to any purification process, was pumped to an equalizing tank and from there distributed through the mains. Besides the public supply, used by only a small proportion of the households, 249 private wells and 89 cisterns were found in use. Of these wells the average depth was 22 feet and the average distance from an insanitary privy was 94 feet; only 10 were equipped with buckets and the remainder were equipped with pumps; almost all of them were dug wells, walled with pervious brick or stone casing; about 50 per cent of them were fairly well protected from surface drainage by curbing and platforms. Of the 89 cisterns, 86 appeared to be water-tight and 3 to have leaking walls.

Neoga had no sewerage system. The water-closets with which several of the dwellings were provided discharged into insanitary cesspools. Of the 281 privies found, 1 was sanitary ("A") type, 10 were B type, 36 were C type, 176 were D type, and 58 were E type.

Jewett.—This village had no public water supply nor sewer system. Water was obtained from 47 wells and 6 cisterns. The average distance of the source of water supply from an insanitary privy was 92 feet. The wells averaged 21 feet in depth. Twenty of the wells were equipped with buckets and 27 with pumps. All of the wells were dug wells with pervious walls. Only 12 of the wells were protected to any considerable degree against surface drainage by tight platforms and curbing. Five of the cisterns appeared to be water-tight and 1 was not water-tight.

Of the 72 dwellings, 3 were not provided with toilets of any kind and 69 were provided with insanitary privies. Of these privies 1 was C type, 35 D type, and 33 E type.

TYPHOID FEVER PREVALENCE.

In the course of the house-to-house canvass there were recorded 514 cases of typhoid as occurring in Cumberland County in the period 1900–1916. This number, which probably is considerably below the actual, would give the county an annual typhoid case incidence of about 23 per 10,000 of population.

SANITARY MEASURES RECOMMENDED.

The measures especially recommended for the rural homes were (1) installation of sanitary privies or sanitary sewerage systems; (2) protection of water supplies from potentially dangerous contamination; (3) protection of foods from invasion by flies; and (4) the prompt institution of rigid cleanliness at the bedside of cases recognized as, or suspected to be, typhoid fever or other infectious disease.

The property owners generally were readily able to meet the expense of installing high-grade sanitary devices and, therefore, such were as a rule recommended. The advantages of the double compartment, dry-cement vault were stressed in this county.

For schools strict and prompt compliance with the State sanitary school law was recommended.

For the towns the measures especially recommended were (1) installation at once of sanitary privy systems; (2) installation or extension as rapidly as practicable of public sewerage systems and water supplies; and (3) the treatment of public water supplies to make them of safe sanitary quality, and the abolishment as rapidily as practicable of polluted private water supplies.

COOPERATION.

The work was done in active cooperation with the Illinois State Board of Health. In its performance, good cooperation was received from the officials of the towns and of the county, from the practicing physicians and the local clergymen, from the local newspapers, from the County Fair Association, and from many individual citizens of prominence. Especially strong and effective support to the work was given by one of the leading physicians of the county who was also a member of the village board of Toledo. He often neglected his private interests to accompany the members of the survey force to different parts of the county in order to assist at the public meetings and to introduce the investigators to the leading local citizens.

The village board of Toledo adopted on record time—within 10 days from the beginning of the survey in the county—an ordinance requiring all privies in Todelo to be made of sanitary type and establishing a municipal scavenger service.

About the time the survey was begun, it was learned that a county fair was to be held two weeks later on the fair grounds at Greenup. An inspection of these grounds determined that the toilet arrangements were of very insanitary E type. They afforded even poor privacy. This matter was taken up on the afternoon of the day the conditions were discovered with the chairman of the board of directors of the fair association. It was explained to him that the fair would offer a good opportunity for a demonstration of the sanitary measures to be recommended at the farm homes throughout the county. He called a meeting of the directors that night. Within a few minutes after assembling the board appropriated the money needed for making the sanitary improvements suggested. Early the next morning the work of installing high-grade adequate cement vault privies on the fair grounds was started. During the fair all sanitary conditions on the grounds were good, and thus an impressive practical demonstration was made to the thousands of visitors to the fair.

The State board of health had an interesting health exhibit, consisting of models and pictures, at the fair, which attracted much favorable attention.

The local newspapers gave the work throughout the period of the survey good publicity. The local clergymen strongly supported and preached sermons on the program of sanitation recommended.

RESULTS.

Although the work in this county was not begun until late summer, and the first month of the survey was in the busiest season of harvesting, the results in the county as a whole were encouraging.

Farm homes.—After the first round of survey had been completed, 1,192 farm homes, selected so as to be fairly representative of all the farm homes in the county, were revisited to ascertain the degree of sanitary improvement accomplished since the first visit. It was found that at 22 per cent of these homes some kind of sanitary improvement had been made, and that in some of the neighborhoods the sanitary work was just getting under way.

At 17 per cent marked improvements in excreta disposal had been effected. At 11 per cent high-grade sanitary privies had been installed in the place of grossly insanitary privies. At over 5 per cent radical improvement had been made in the source of water supply. The season was too late when the work was begun to expect progress in screening of dwellings before the following spring.

Schools.—The work of carrying out the sanitary measures was being pushed vigorously at the schools. Of 72 schools resurveyed, 67 per cent were found to have properly safeguarded sources of water supply, and at 40 per cent sanitary privies had been installed.

Railroad stations.—At over 50 per cent of the railroad stations in the county adequate sanitary privies were found on the resurvey.

Villages.—The governing board of each of the four villages adopted an ordinance providing for the installation of a sanitary privy system.

The best progress was made in Toledo. When the survey period terminated, December 4, over 50 per cent of the 228 insanitary privies in that village had been converted into sanitary type; a scavenger service was in operation to effect cleaning and sanitary disposal of contents of all privies once each week; and the work of installing the sanitary privy cans and boxes was still in progress. The installations had been delayed by the difficulty, resulting from war conditions, in securing galvanized-iron cans.

In Neoga the work was started considerably later than it was in Toledo, but when the survey terminated over 30 per cent of the 280 insanitary privies in Neoga had been converted into sanitary type; a scavenger service had been established and the installation of sanitary privies was in progress. Besides the improvement in privies definite arrangements had been effected in Neoga for the installation of a sewerage system to drain all of the business section and about one-fourth of the residences in the village.

In Greenup the sanitary ordinance was not to become effective until December 10, but by December 1, 40, or 14 per cent, of the 280 insanitary privies in that village had been converted into sanitary type, a scavenger service had been established, and the prospects for the work to be carried forward to completion appeared reasonably good.

Jewett was the only one of the four villages which at the end of the survey eriod had not made progress and which did not present good prospects for rogress in the near future. The village board of Jewett had passed a sani-ıry ordinance, but did not seem disposed to enforce it actively.

The work of installing a sanitary-privy system in Toledo attracted con-iderable attention from outside the county. Delegations—as a rule including ıe mayor, the health officer, and members of the town council—from Oakland, ffingham, Mattoon, Olney, and Paris, in Illinois, visited Toledo in the latter art of the survey to observe the working of the sanitary-privy system and to onfer with the officer in charge of the survey about the necessary steps to get ıe work started in a town.

Typhoid-fever reduction.—The work became effective too late in the typhoid eason of 1916 to play any considerable part in whatever, if any, reduction in ıe typhoid rate may have occurred for that year. The typhoid-fever rate f prevalence for the county in 1917 as compared with that in previous ears has not been ascertained.

CONCLUSION.

With an adequate county health organization to continue the work and ith an application of the methods for effecting among the citizens a cooper-tive arrangement in the actual construction of sanitary devices, there would e no room for reasonable doubt that Cumberland County, Ill., soon would ttain as a whole a high standard of rural sanitation.

APPENDIX A.

SANITARY ORDINANCES ADOPTED.

For almost all of the incorporated towns and villages within the counties surveyed, sanitary ordinances, in conformity with the recommendations for sanitary improvements made by the officers of the survey, were adopted by the respective town or village governments.

The following are samples of ordinances adopted, with particular respect to securing sanitary disposal of human excreta:

MITCHELL, IND.

An ordinance of the city of Mitchell, Ind., concerning privies, prohibiting the ownership, possession, keeping, control, maintenance, and use of privies in the city of Mitchell, Ind., unless the same be provided with water-tight and fly-proof receptacles for holding human excreta, prohibiting the placing of human excreta in or on the soil so that the same are or shall come in contact with the soil, prohibiting the overflowing of the receptacles, prohibiting leaky, foul, and ill-smelling receptacles and use of such receptacles, providing for the removal and correction by the said city of Mitchell, after notice, of full, foul, and ill-smelling and leaky receptacles, and receptacles not fly-proof, and providing a lien on the premises for the costs and expenses of such removal and correction, and the foreclosure of such lien, and providing penalties for the violation of the provisions thereof.

SECTION 1. Be it ordained by the city of Mitchell, Ind., that it shall be unlawful for any person, persons, firm, association, or corporation to own, have, keep, control, or maintain for use as a privy, or permit to be used as a privy, any privy in the city of Mitchell, Ind., unless the privy be provided with water-tight cans, tubs; vaults, cesspools, or other water-tight receptacles for the holding of human excreta deposited therein. Human excreta in this section, and in each and every section of this ordinance wherein used, mean and include either human feces or human urine, or both human feces and human urine.

SEC. 2. That it shall be unlawful for any person, persons, firm, association, or corporation to own, have, keep, control, or maintain for use as a privy, or permit to be used as a privy, any privy in the city of Mitchell, Ind., unless the privy be provided with cans, tubs, vaults, cesspools, or other receptacles for the holding of human excreta deposited therein so constructed and maintained as to exclude from said receptacles all flies, and so constructed and maintained as to prevent the access of flies to the human excreta therein contained.

SEC. 3. That it shall be unlawful for any person to use any privy in the city of Mitchell, Ind., unless the privy be furnished and provided with water-tight cans, tubs, vaults, cesspools, or other water-tight receptacle or receptacles for the holding of human excreta deposited therein.

SEC. 4. That it shall be unlawful for any person to use any privy in the city of Mitchell, Ind., unless the privy be furnished with and provided with cans, tubs, vaults, cesspools, or other receptacle or receptacles that are so constructed, kept, and maintained that flies can not have access to the human excreta in the cans, tubs, vaults, cesspools, or other receptacle or receptacles in which human excreta are contained.

Sec. 5. That it shall be unlawful for any person, persons, firm, association, or corporation to dispose of human excreta, or permit the disposal of human excreta by placing the same on or in the soil in the city of Mitchell, Ind., so that the same is in contact with the soil, or may come in contact with the soil.

Sec. 6. That it shall be unlawful for any person, persons, firm, association, or corporation who shall own, have, control, or maintain any privy in the city of Mitchell, Ind., to permit the human excreta in the cans, tubs, vaults, cesspools, or in any other receptacle or receptacles in said privy, to overflow the receptacle or receptacles in which it is contained.

Sec. 7. That it shall be unlawful for any person, persons, firm, association, or corporation who shall own, have, control, or maintain any privy in the city of Mitchell, Ind., to permit the cans, tubs, vaults, cesspools, or other receptacle or receptacles containing human excreta to become and be leaky, so that the human excreta therein contained shall flow or escape therefrom because of the leaking condition thereof.

Sec. 8. That it shall be unlawful for any person, persons, firm, association, or corporation to own, have, keep, control, or maintain any privy in the city of Mitchell, Ind., the cans, tubs, vaults, cesspools, or other receptacle or receptacles of which have become foul and ill smelling because of their contents.

Sec. 9. That it shall be unlawful for any person to use any privy in the city of Mitchell, Ind., while the cans, tubs, cesspools, vaults, or other receptacle or receptacles in which the human excreta are held are foul and ill smelling, or while the same are in a leaky condition, or while the same are overflowing.

Sec. 10. That whenever any can, tub, vault, cesspool, or other receptacle or receptacles, in any privy in the city of Mitchell, Ind., used for the deposit of human excreta therein, shall have become filled with human excreta, or whenever the same have become foul and ill smelling, or when the same have become leaky, thereby permitting the human excreta to escape and flow therefrom, or have ceased to be in such condition as to prevent the access of flies to the human excreta contained therein, it shall become and be the duty of the marshal of the city of Mitchell, Ind., and it is now herein and hereby made the duty of said marshal to give to the owner or owners of the privy a written notice signed by said marshal, informing such owner or owners of the condition of the cans, tubs, vaults, cesspool, or other receptacle or receptacles, and directing such owner or owners to have the cans, tubs, vaults, cesspools, or other receptacle or receptacles, emptied, or the foul and ill smelling condition abated or removed, or the leaky condition repaired or stopped, or the condition permitting the access of flies to the human excreta changed or corrected so as to make the same inaccessible to flies, within 48 hours from the time of the service of such notice on such owner or owners, and if such owner or owners be not residents of the said city of Mitchell, or be not in the said city of Mitchell at the time said marshal desires to serve said notice under the provisions of this ordinance, then such notice may be served upon the agent having charge of the premises whereupon such privy is located, provided such agent resides in and is in the said city of Mitchell at that time, and if there be no agent residing in or in said city of Mitchell at the time the said marshal desires to serve said notice, then said notice may be served by said marshal upon the occupant of any building on said premises, and if there be no occupant on the premises, then and in that case the said marshal shall attach to the privy, at some conspicuous place on the outside thereof, said notice, said notice shall be dated and shall contain the hour of service and shall inform the owner or owners as follows:

That the cans, tubs, vaults, cesspools, or other receptacle or receptacles have become filled with human excreta.

That the cans, tubs, vaults, cesspool, or other receptacle or receptacles have become and are ill smelling and foul.

That the cans, tubs, vaults, cesspool, or other receptacle or receptacles have become and are leaky and are not water-tight.

That the cans, tubs, vaults, cesspool, or other receptacle or receptacles permit flies to have access to the human excreta therein contained.

And said notice shall direct and request the owner or owners to remedy and correct the condition pointed out by the said marshal within 48 hours from the time of the service of said notice. In counting the time of 48 hours Sunday shall not be included.

If the owner or owners of said privy shall fail, refuse, or neglect to heed said notice, and shall fail, refuse, or neglect to remedy and correct the condition or conditions pointed out in said notice, within the time fixed, the said marshal is now authorized and directed, without any other order or direction or ordinance, to obtain the necessary materials and employ the necessary labor, and to enter upon said premises where said privy is located with said materials and labor, and to remedy and correct the conditions stated in said notice in the way and manner set out in said notice, by emptying the said cans, tubs, vaults, cesspool, or other receptacle or receptacles when the same are full, or by abating the foul and ill smelling condition when the cans, tubs, vaults, cesspool, or other receptacle or receptacles are foul and ill smelling, or by repairing or replacing the cans, tubs, vaults, cesspools, or other receptacle or receptacles when the same are in a leaky condition, so as to make the same water-tight, or by making the cans, tubs, vaults, cesspool, or other receptacle or receptacles so that the contents of the same shall not be accessible to flies. The said marshal shall be paid by the city of Mitchell, Ind., and the amount thereof shall become and be a lien upon the entire premises upon which said privy is located, and said lien may be foreclosed by said city of Mitchell at any time within one year from the completion of the work in the Lawrence circuit court, Indiana, as the liens of contractors, subcontractors, mechanics, journeymen, laborers, and all persons performing labor and furnishing materials are foreclosed. In all suits brought for the enforcement of any lien under the provisions of this ordinance the city of Mitchell, Ind., shall be entitled to recover reasonable attorney fees, which shall be entered by the court trying the same as a part of the judgment of said suit.

Sec. 11. Any person, persons, firm, association, or corporation violating the provisions of sections 1, 2, 5, 6, 7, and 8, or violating either of said sections, or any of the provisions of any section, shall be fined in any sum not exceeding $25, and any person or persons violating the provisions of sections 3, 4, 8, and 9, or violating either of said sections, or any of the provisions of any of said sections, shall be fined in any sum not exceeding $25. Each day of violation of the provisions of the sections of this ordinance, or of the violation of any one of the sections of this ordinance, shall be a separate offense, and there may be as many prosecutions for the violations of this ordinance as there are days of violation. It shall not be a defense to any prosecution for the violation of the provisions of this ordinance that no notice of the conditions of the privy had been given by the marshal or by any officer of the said city of Mitchell, or by any health officer or by any officer or person whosoever, and it shall be no defense to any prosecution if any notice was given prior to the prosecution that the notice was followed and complied with and the condition corrected and remedied prior to the commencement of the prosecution.

Sec. 12. This ordinance shall be in force from and after its passage and publication for two weeks consecutively in the Mitchell Commercial, of said city of Mitchell, the first of which publications shall be on the 10th day of December, 1914, and the last on the 17th day of December, 1914.

New Albany, Miss.

An ordinance requiring sanitary privies in the city of New Albany.

Section 1. Be it ordained by the mayor and board of aldermen of the city of New Albany, Miss., that after 30 days from date it shall be unlawful for any person to use any privy within the corporate limits of said city unless the same shall have been provided with water-tight metal tubs for the reception of all human excreta, and that all such tubs shall be so screened that they will be inaccessible to flies and kept in a sanitary condition.

Sec. 2. It shall be unlawful for any property owner or their agents to rent to or collect rents from any resident tenant unless the premises of such tenants be provided with a sanitary water-closet or a sanitary privy.

Sec. 3. It shall be unlawful for any person to dispose of or permit the disposal of human excretions (feces or urine) on any property owned or occupied by him, the public streets, or any other property within the corporate limit of New Albany in an insanitary manner. Said excretions to be disposed of in either a sanitary water-closet or a sanitary privy.

Sec. 4. Any person failing to comply with the requirements of this ordnance shall be guilty of a misdemeanor, and upon conviction shall be fined in any sum not exceeding $25 for each offense, and stand committed to jail until the fine and cost are paid.

Sec. 5. On the trial of any person charged with violating the requirements of this ordinance the opinion of the city or county health officer who has viewed such premises shall be prima facie evidence of their sanitary condition.

Sec. 6. No part of this ordinance shall be so construed as to interfere with the successful operation of any sanitary ordinance of the city now in effect.

Cambridge, Md.

Ordinance No. 64. Revised ordinance of Cambridge, new series.

Section 1. Be it enacted and ordained by the Commissioners of Cambridge that it shall be unlawful for any person to have or maintain any water-closet or privy within the corporate limits of Cambridge, unless the same is maintained and kept according to the provisions of this ordinance.

Sec. 2. Every water-closet or privy on the line of any sewer or in any place where it is possible to connect it with any sewer shall be connected with a sewer and shall be furnished with a sufficient water flush.

Sec. 3. The existence on any premises of any water-closet or privy in such a condition that it can be used as a water-closet or privy, when the same is not connected with a sewer, shall be conclusive evidence that the same is used as a water-closet or privy.

Sec. 4. It shall be unlawful for any person to throw or pour any wash or waste water into any water-closet or privy unless the same is connected with a sewer.

Sec. 5. In all parts of the city of Cambridge where it is not possible to connect any water-closet or privy with a sewer a surface closet or privy may be maintained, but the same shall be furnished with a water-tight receptacle for the excreta, and such water-closet or privy and all excreta shall be securely screened, so that no flies can enter the same or come in contact with the excreta.

Sec. 6. Any person violating any of the provisions of this act shall be deemed guilty of a misdemeanor, and on conviction therefor before a justice of the peace having jurisdiction, or in the circuit court for Dorchester County, shall be fined not less than fifty nor more than three hundred dollars or may be imprisoned in the Maryland House of Correction not less than six months nor more than two years.

Sec. 7. The commissioners of Cambridge may abolish any surface water-closet or privy at any time by giving the owner of the premises on which the said water-closet or privy is located not less than 15 days' notice, in writing, to remove or abolish the same. The notice shall be as follows:

"To ———, owner of No. ——, ——— Street, Cambridge, Md.:

"You are hereby ordered to remove the surface water-closet or privy at No. —— ——— Street, Cambridge, Md., on or before the —— day of ———, 19—.

"By order of the commissioners of Cambridge.

"——— ———,

"Town Clerk, Treasurer, and Collector."

Sec. 8. This ordinance shall take effect from the date of its passage.

Fredonia, Kans.

An ordinance requiring sanitary privies in the town of Fredonia, Kans.

Section 1. Be it ordained by the mayor and council of the city of Fredonia, Kans., that after 15 days from the publication of this ordinance it shall be unlawful for any person to use any privy within the corporate limits of said city, unless the same shall have been provided with water-tight metal receptacles for the reception of all human excreta, and that all such buckets shall be so screened that they will be inaccessible to flies and kept in a sanitary condition.

Sec. 2. It shall be unlawful for any person to dispose of or permit the disposal of human excreta (feces and urine) on any property owned by him, on the public streets or on any other property within the corporate limits of Fredonia, in an unsanitary manner. Said secretions may be disposed of in a sanitary water-closet or in a sanitary privy.

Sec. 3. Any person failing to comply with the requirements of this ordinance shall be guilty of a misdemeanor and on conviction shall be fined in any sum not exceeding $25 for each offense and stand committed to jail until the fine and cost are paid.

Sec. 4. On the trial of any person charged with violating the requirements of this ordinance the opinion of the city, county, or State health officer who has viewed such premises shall be prima facie evidence of their sanitary condition.

Sec. 5. No part of this ordinance shall be so construed as to interfere with the successful operation of any ordinance now in effect.

NEODESHA, KANS.

An ordinance requiring sanitary privies and water-closets, and prohibiting the maintenance or use of unsanitary privies or water-closets in the city of Neodesha, Kans.

SECTION 1. That from and after 20 days after the passage of this ordinance it shall be unlawful for any person to maintain, use, or permit to be used any privy or water-closet within the corporate limits of Neodesha, Kans., unless such privy or water-closet, if within any sewer district of said city, shall have been connected with the sewer system of said city, or, if within any sewer district, shall have been connected with said sewer system or provided with water-tight buckets for the reception of all human excreta, and all such buckets shall be so screened that they will be inaccessible to flies, and shall be kept in a sanitary condition.

SEC. 2. It shall be unlawful for any person to dispose of or permit the disposal of human excreta (feces or urine) on any property owned or occupied by him, the public streets, or any other property within the corporate limits of said city of Neodesha in an unsanitary manner. Said excretions to be disposed of in either a sanitary water-closet or a sanitary privy.

SEC. 3. Any person violating any of the provisions of this ordinance or failing to comply with the requirements thereof shall be deemed guilty of a misdemeanor, and upon conviction shall be fined in any sum not exceeding $100 and shall be committed to the city jail until such fine and costs are paid. Each day's continuance of any violation shall constitute a separate offense and be punished as such.

SEC. 4. On the trial of any person charged with the violation of any of the provisions or requirements of this ordinance, the opinion of the city, county, or State health officer, who has viewed the premises, shall be prima facie evidence of their sanitary condition.

SEC. 5. No part of this ordinance shall be so construed as to interfere with the operation of any ordinance of the city now in effect.

SEC. 6. This ordinance shall be published in the Neodesha Register and shall take effect and be in force from and after 10 days after its final passage.

ANNAPOLIS, MD.

An ordinance to add fourteen new sections to article XXXVII of the City Code of Annapolis, title "Sinks," said new sections to be known as sections 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, and 21.

SECTION 1. *Be it established and ordained by the mayor, counselor, and aldermen of the city of Annapolis*, That Article XXXVII of the Revised City Code, title "Sinks," be and the same is hereby amended by adding thereto 14 new sections, to follow section 7, and to be numbered sections 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, and 21, and to read as follows:

"SEC. 8. On and after December 1, 1915, it shall be unlawful for any person to use or maintain on his or her property any privy within the corporate limits of Annapolis unless the same be provided with water-tight receptacles for the reception of human excreta and be kept in sanitary condition.

"SEC. 9. On and after April 1, 1916, it shall be unlawful for any person to use any privy within the corporate limits of Annapolis or to maintain any privy within said city unless the same be so constructed that flies can not gain access to the excreta deposited therein.

"Sec. 10. It shall be unlawful for any person to dispose of or permit the disposal of human excreta on any property owned or leased or occupied by him or them on the public streets of Annapolis, or on any other property within the corporate limits, in an insanitary manner.

"Sec. 11. After the passage of this ordinance it shall be unlawful for any person, firm, or corporation to construct or build within the corporate limits of Annapolis any privy without first applying in writing to the city commissioner for a permit allowing the construction of said privy and receiving said permit, said permit to be issued free of charge.

"Sec. 12. All privies where permit is granted by the city commissioner shall be built or constructed according to specifications to be furnished by the said city commissioner.

"Sec. 13. All privies in existence within the corporate limits of the city of Annapolis prior to the adoption of this ordinance shall be remodeled on or before December 1, 1915, under the supervision of and according to the specifications to be furnished by the city commissioner.

"Sec. 14. Whenever the condition of a privy is such that it can not be put in sanitary condition, the same is hereby declared a public nuisance and the city commissioner shall order the property owner to construct a new privy within 30 days after notice, in conformity with section 5 of this ordinance.

"Sec. 15. On and after the passage and adoption of this ordinance the city commissioner shall give written notice to the property owner or owners or his, her, or its agent, or agents, on whose premises there exist privies which consist of holes or wells in the earth for the reception of human excreta, requiring them to have the same cleaned out and filled in with earth or some suitable material on or before December 1, 1915, and requiring the same to conform to those described in specifications to be furnished by said city commissioner.

"Sec. 16. It shall be unlawful for any person, firm, or corporation directly or through an agent or agents to rent or collect rents from any resident tenant unless the premises of such tenant be provided with a sanitary water-closet or a sanitary privy.

"Sec. 17. A public scavenger service shall be operated by the city of Annapolis for the proper removal and sanitary disposal of the contents of privies in said city; said removal and disposal to be made at least once in each and every week from every privy affected by this ordinance.

"Sec. 18. The city collector and treasurer is hereby empowered and directed to charge and collect $5 per annum, payable in quarterly installments on the first day of January, April, July, and October of each year, for the scavenging of each privy within the corporate limits of Annapolis, the fees so charged and collected to be used to defray the expenses of scavenging said privies.

"Sec. 19. The cost of such scavenging shall be at the expense of the property owner and said expense shall be certified by the chief of police, whose duty it shall be to notify the person, firm, or corporation owning the property of the amount due, which shall be payable within 30 days next thereafter, and if the said property owners do not pay said bills within such time then the chief of police shall turn over such bills to the city counselor, who shall proceed by proper legal methods to collect the amounts due.

"Sec. 20. Any person, firm, or corporation violating or failing to comply with any of the provisions of this ordinance, shall be guilty of a misdemeanor and shall be subject to a penalty of not less than $5 nor more than $20 for each offense, and where any such violation is continuous each week thereof shall constitute a separate offense.

"Sec. 21. On the trial of any person, firm, or corporation charged with violating any of the requirements of this ordinance, the opinion of the city health officer, the deputy State health officer, or of the city commissioner, who has inspected the premises in question, shall be prima facie evidence of the sanitary condition of such premises."

Sec. 2. And be it established and ordained by the authority aforesaid that this ordinance shall take effect from the date of its passage.

Hillsboro, N. C.

Every owner of property within the corporate limits of the town of Hillsboro shall be required to provide for every occupied dwelling belonging to him or her a sanitary privy adequate for the use of said dwelling, which privy shall be constructed according to the specifications of the United States Sanitary Survey.

It shall be unlawful for any person, firm, or corporation to maintain an insanitary privy within the meaning of this section within the corporate limits of Hillsboro.

Persons failing to comply with the provisions of this ordinance by the 14th day of July, 1915, shall be liable to indictment .

Chapel Hill, N. C.

1. That all persons owning a surface closet within the corporate limits of the town of Chapel Hill shall have the same removed or remodeled so as to be sanitary. A surface closet will not be considered sanitary unless it is fly proof and water-tight.

2. All persons are forbidden hereafter to erect within the corporate limits of the town any surface closet without the written permission of the health officer of the town. All persons are forbidden to erect any dwelling or house for business purposes on any street within the corporate limits of the town within 300 feet of the sewer without making connection with the sewer for at least one water-closet unless impossible because of grade.

3. No person shall be allowed to dispose of the contents of any surface closet within the town, but the town shall have an authorized agent who shall, at stated intervals, collect the contents of all surface closets and carry said contents to a point at least one-half mile from town to a place designated by the health officer. The town charges 50 cents per month for each surface closet for such service.

4. All persons owning stables within the corporate limits of the town shall keep them in a sanitary condition. No stable shall be erected within the corporate limits of the town after the enactment of this act without the written consent of the health officer. He shall have power to refuse such consent when in his judgment such stable will be detrimental to the health of the community or offensive to those residing in said neighborhood.

5. On and after October 1, 1915, no surface closet shall be maintained within 300 feet of that part of any street traversed by the sewer line: *Provided*, That the board of aldermen may grant an extension of time to those who are endeavoring to comply with this ordinance, but have not been able to secure the services of a plumber.

6. On and after January 1, 1915, no hogs shall be kept within the corporate limits of the town west of Columbia Street and south of a line 200 feet north

of Rosemary Street, and east of Columbia Street and 500 feet north of North Street.

7. This ordinance shall be in full force and effect on and from the 1st day of September, 1915, and shall be published in the Chapel Hill News, and a copy posted at the post office.

8. Every person, firm, or corporation failing to comply with the requirements of this ordinance shall be subject to a fine of $1 for every day for each and every stable or closet maintained, kept, or used.

West Greenville, S. C.

An ordinance requiring sanitary surface closets.

Section 1. That all surface closets or outhouses within the town of West Greenville shall have a box and a water-tight metal can for each hole in said box to receive all human waste or secretions; said box to be constructed out of good strong boards in a substantial manner; the box for one single-hole surface closet is to be 2 feet long, 2 feet wide, and 20 inches deep, and to have a 4 by 3 inch hole in front and a 4 by 6 inch ventilator, and double closets or double-hole closets are to have twice the size box, so that where there is more than one hole there shall be a like-size receiving compartment for each hole constructed in the same manner, with a proper can for holding the waste. For the purpose of enforcing this ordinance the police of the town of West Greenville are to act as sanitary inspectors, and all such closets shall be kept in a sanitary condition on all premises. No dry wells or cesspools shall be allowed in the town of West Greenville, and only water-tight and fly-proof receptacles shall be used to receive human secretions. That all property owners are hereby required to install the said boxes and cans in all of the said closets on their premises on or by September 1, 1916. And all persons who shall occupy any premises and all owners of any premises are hereby required to install and to keep said boxes and cans in all such sanitary closets; and upon failure to do and act and to provide and use said sanitary closets in the manner prescribed in this ordinance shall subject each person who so fails or in any way violates this ordinance upon conviction to pay a fine of $5 for each offense or to be imprisoned not less than 5 days or more than 30 days at the usual hard labor. This ordinance shall take effect on September 1, 1916, and shall continue in force from said September 1, 1916.

Sec. 2. That it shall be the duty of the scavenger department of West Greenville to regulate and control all surface closets or privies in the city of West Greenville. That said department shall make all necessary arrangements for the collection of all night soils from said surface closets or privies and dispose of the same at the incinerator or as hereafter to be provided for. That all surface closets or privies shall be cleaned by said department at least once a week, and oftener if necessary, and it shall be the duty of all property owners, occupants, or tenants to give free access to the employees of said department to premises occupied by said closets or privies, and to put the same in condition now provided for by law. It shall be the duty of the owner of any privy or surface closet in the city of West Greenville to pay to the city clerk and treasurer the following dues: For closet or privy, 75 cents per quarter, or $3 per year, payable quarterly or annually in advance. Any arrearage in the payment of dues shall be collected in the same manner as now provided for delinquent taxes.

OBION, TENN.

An ordinance to provide for the sanitary disposal of human waste matter within the limits of Obion, Tenn.

Article 1. Sanitary method of disposal enjoined upon occupants and owners of premises.

SECTION 1. No owner or agent for any real estate within the town of Obion, Tenn., upon which a building is situated shall let or lease the same for residential purposes or permit the same to be occupied as a residence unless the same shall be provided with a sanitary method of disposal of human waste matter.

SEC. 2. It shall be unlawful for any person to deposit human excrement or for the dweller or proprietor of any lot or premises to permit of the deposit of human excrement in or on any place within the limits of the town, except in a sanitary privy or sanitary water-closet.

SEC. 3. No privy or septic tank shall be constructed or maintained hereafter within 25 feet of the door or window of any building occupied as a residence.

SEC. 4. The construction or maintenance of cesspools in the town of Obion is hereby prohibited.

SEC. 5. In case of failure to comply with section 1 of this article the city shall order and execute the necessary improvements, the cost of the same being charged to the owner of the property and the owner further subject to fine, as hereinafter provided.

Article 2. Definition of terms.

SECTION 1. " Sanitary disposal of human waste matter " is the disposal of human waste matter by means of a sanitary privy or sanitary water-closet.

SEC. 2. " Sanitary privy." By this term shall be meant a privy provided with one or more water-tight metal receptacles of about 1 bushel capacity for the reception of human waste matter, said receptacles being located in the compartment beneath the seat, which compartment must be so constructed as to exclude flies. This compartment must further be provided with a floor, a hinged door to permit of the removal of the receptacles, and a ventilating flue of some kind extending from beneath the seat out through the top of the building or to a point just beneath the eaves of the building. The openings of the seat shall be covered with well-fitting lids which shall completely cover said openings, and so arranged as to close the openings by their own weight. There shall be at least one receptacle provided for each four persons or fraction thereof using the privy above the age of 3 years. The receptacle or receptacles shall not at any time be permitted to overflow.

SEC. 3. " Sanitary water-closet." Any type of flush closet whose effluent drains into a properly constructed septic tank. The term " properly constructed" used in this connection refers to a septic tank whose effluent is disposed of by means of subsurface drain tile, or filter trench, no part of which shall be closer than 150 feet from a well, and all parts of which must be down slope from same. No septic tank shall be considered " properly constructed " which at any time shall be permitted to overflow or give off offensive odors.

SEC. 4. " Septic tank." Any tank or excavation into the earth having water-tight walls which is used for the reception of human waste matter, together with the water used in the carriage of said waste matter.

SEC. 5. " Cesspool." The same as described under " septic tank," excepting such tank or excavation has not water-tight walls.

SEC. 6. " Human waste matter," " human excrement." These terms refer to the fecal and urinary discharges of the human body.

Article 3. Operation of the ordinance.

Sec. 1. The disposal of human excrement deposited in the receptacles of the sanitary privies shall be the duty of the city's scavenger. It shall be his duty to visit and inspect the privies and to remove in a cleanly manner the human excrement from the receptacles thereof at least once a week. The cans in every case shall be effectively cleaned by the scavenger before replacing into the privies. He shall also make report to the city marshal of any conditions found about the privy prejudicial to the sanitary operation of the same, whereupon the city marshal shall inspect said privy and enforce whatever penalty may be suitable within the provisions of this ordinance.

Sec. 2. The receptacle or receptacles used in the collection of human excrement from the privies must be water-tight and kept covered when passing through the alleys or streets of the city or along the public highway, in such a manner as to exclude flies and prevent the escape of foul odors.

Sec. 3. Having collected his load of human excrement, the scavenger shall proceed directly to the disposal grounds, which shall be specified by the city council. The method of disposal shall be by shallow earth burial not less than 6 inches in depth nor more than 12.

Sec. 4. No person shall deposit in the receptacles of the sanitary privies anything except human excrement and the necessary toilet paper or paper of similar consistence.

Sec. 5. The measures necessary to provide a sanitary method of disposal of human waste matter at each place, as required in article 1, section 1, of this ordinance, shall be met by the owner of the premises in each and every case.

Sec. 6. The cost of keeping the privies in a sanitary condition—i. e., the scavenger service—shall be met by the occupant of the premises to which the privy belongs.

Sec. 7. All the provisions of this ordinance shall be in force within 30 days from the publication of same, which shall be made in the first issue of the local newspaper following the passage of this ordinance.

Sec. 8. Violation of any of the provisions of this ordinance shall be classed as a misdemeanor, and a fine of not less than five nor more than fifteen dollars for each count shall be imposed and collected by the proper authorities.

Excelsior Springs, Mo.

Ordinance No. 2033. An ordinance in relation to a sanitary method for the disposal of human excreta in the city of Excelsior Springs, Mo.

Section 1. Any person, persons, firm, or corporation owning property within the limits of the city of Excelsior Springs, Mo., and using, renting, or leasing the same for residential purposes is hereby required to have and maintain on said property a sanitary method for the disposal of human excreta, which shall consist of a sanitary water-closet whenever said property is or may hereafter be in a sewer district is built, or a sanitary privy.

Sec. 2. That it shall be unlawful for any person to deposit within the city limits any human excreta, except in a sanitary privy or in a sanitary water-closet.

Sec. 3. It shall be unlawful for any property owner or tenant to permit the deposit of any human excreta in or upon the property owned or leased by him within the limits of the city or Excelsior Springs, Mo., except in a sanitary water-closet or in a sanitary privy.

SEC. 4. That cesspools within the city limits are hereby abolished.

SEC. 5. It shall be unlawful for any person to deposit or permit to be deposited in any sanitary privy anything except human excreta, paper, and disinfectants.

SEC. 6. "Human excreta" shall consist and be defined as the bowel and kidney discharges of human beings.

"Sanitary privy" shall be defined as any surface privy provided with, first, water-tight galvanized-iron receptacle, 14 inches in diameter, 14½ inches high, and made of 24-gauge galvanized iron; second, fly-tight box, 17 inches high and 18 inches wide, inside measurement, not less than 3½ feet long, for the accommodation of two persons and 2 feet long for the accommodation of one person. Each opening in the fly-tight box shall be (completely covering the opening) provided with a tight-fitting lid. The lid shall be hinged with a spring hinge, so that they shall fall into place of their own accord and remain in place when not in use.

The top of the privy box shall be hinged, or if preferred there may be a hinged door at the back of the box for the removal of the receptacle therein contained. All openings for ventilation shall be screened against flies. Third. Proper ventilation shall be provided for by a flue, not less than four inches square, inside measurement, extending from the inside of the privy box through the roof, or to a point just beneath the eaves.

"Sanitary water-closet" is defined as any type of flush closet with a fly-tight top, the effluent of which either is connected with a septic tank or a running stream by a water-tight sewer pipe.

"Cesspool" is defined as an excavation in the ground without both water-tight sides and bottom used for the reception of human waste.

SEC. 7. The mayor, by and with the consent of the city council, shall appoint a city scavenger, under bond, whose duty it shall be to visit and clean every closet now existing in the city of Excelsior Springs. The compensation therefor shall be collected from the property owner or occupant for the initial cleaning, which shall be fixed by the board of health, unless by a special contract between the city scavenger and owner or occupant.

SEC. 8. The city scavenger shall visit every sanitary privy in the city not less than once in every seven days, removing the buckets from the privy boxes, replacing them with empty buckets, covering the full buckets with a well-fitted lid. These shall then be hauled to a place designated by the board of health of the city of Excelsior Springs, Mo., where they shall be emptied and washed.

SEC. 9. The city scavenger shall collect not more than 50 cents per month from the occupant of the premises on which the privy is located. The fee, if not paid promptly by the occupant, the same shall be reported to the board of health, and it shall adopt measures necessary to collect it. The board of health shall also fix the fee of the city scavenger, which shall not exceed 50 cents per month.

SEC. 10. The occupant shall report to the board of health any failure on the part of the scavenger to clean the privies regularly.

SEC. 11. It shall be the duty of the occupant of the premises on which any sanitary privy is situated to maintain and keep the same in a decent and sanitary manner.

SEC. 12. In case of failure by the property owner to construct a sanitary water-closet, or a sanitary privy, the city is hereby empowered to make the necessary improvement and assess the cost of same against the property owner.

SEC. 13. Any person, persons, firm, or corporation violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and any person who shall fail or refuse to comply with any of the provisions of this ordinance shall, upon conviction be deemed guilty of a misdemeanor, and fined not less than $1 nor more than $200 for each offense.

Sec. 14. All ordinances or parts of ordinances in conflict with this ordinance are hereby repealed in so far as they conflict.

Sec. 15. This ordinance shall take effect and be in force from and after the date of its passage and approval.

Explanatory.—You will note that the above ordinance becomes effective August 31, 1916. In order to make the changes which are made necessary through the enforcing of this ordinance as easy as possible on the property owner, the council has arranged for the manufacture of boxes in lots of 100 at a saving of about $100, which can be placed in your closet at a minimum cost.

The metal water-tight receptacles provided for in the ordinance will be furnished by the city.

In case you have no other means of complying with the provisions of this ordinance, if you will communicate with some member of the health board, a box will be ordered for you at a cost of not exceeding $4.

This notice is official.

Inspection will be made after the 5th of October to see that the provisions of the ordinance have been complied with.

Tuscaloosa, Ala.

Ordinance No. 311. An ordinance providing for the proper disposal of human excreta in the city of Tuscaloosa, and prescribing construction, maintenance, scavenging, and inspection of privies, etc.

Section 1. It shall be unlawful for any property holder or his authorized agent to permit upon any of his property in Tuscaloosa a privy or dry closet of any kind or description, for the reception of human excreta, to be maintained or to exist, where any of the improvements on said property are connected with a public sewer of said city.

Sec. 2. It shall be unlawful for any person in Tuscaloosa to throw out, deposit, or bury within the city limits any excreta from human bodies, solid or liquid, or to dispose of such substance in any manner other than into a properly sewered water-closet or a properly constructed sanitary privy.

Sec. III. All buildings or other places in said city where human beings live, are employed, or congregate shall be provided with a sewered water-closet or a sanitary privy for the catchment or receiving of human discharges which will properly dispose of and safeguard such matter.

Sec. IV. It shall be unlawful for any property holder or his authorized agent to construct, maintain, or permit to exist on any property or properties under his control, where sewer connection has not been made, a privy, unless the same is sanitary or is constructed as provided hereinbelow.

Sec. V. A sanitary privy is one so built, rebuilt, or constructed that (*a*) the excreta deposited therein will not fall upon the ground, but in some water-tight receptacle; and (*b*) the contents of which receptacle shall not be accessible to flies, fowl, or small animals at any time. (*c*) The box parts of said privy shall be constructed of sound lumber, all joints being made tight. Said box is to be provided with a lid closely fitting, and the seat thereon is to be covered with a self-falling hinged lid, so as to render such box fly proof. (*d*) Proper ventilation of such box shall be provided by means of suitably placed openings or flue. Such ventilating openings are to be screened with a good grade 14-mesh wire screening. (*e*) Such privies shall be so located as to be easily accessible to the scavenger for cleaning.

SEC. VI. The health officer of Tuscaloosa shall prescribe by regulations proper sizes and methods of construction of such privies and such other details as will render this ordinance effective and its application uniform. All such privies must conform to such regulations.

SEC. VII. The contents of all privy receptacles shall be removed by the city scavenger. Such removal and cleaning shall be done under the supervision of the city health officer, and for such services the following charge shall be made: For cleaning each privy at private homes, $1 per quarter in advance from each family using such privy; for all privies containing more than one receptacle an additional charge for each receptacle shall be 25 cents per quarter in advance.

The fees or charges set out in this section shall be paid by the occupant or owner of said premises or each family using such privy to the sanitary officer or at the office of the city clerk at the beginning of each quarter: *Provided, however*, That a deduction of 25 cents shall be made from the above charges if same are paid within the first 10 days of each quarter.

SEC. VIII. All sanitary privies in said city shall be kept in a cleanly condition at all times and so used that all excreta deposited therein will fall into the receptacle provided. Such receptacle shall be used only for the purposes of a toilet, and no wash water, garbage, or other refuse matter other than human excreta shall be deposited therein.

SEC. IX. No privy receptacle shall be permitted to become filled to overflowing. If emptying of privy receptacles becomes necessary oftener than hereinbefore provided, it shall be the duty of the occupant of the property to notify the city health officer, and such privy shall be cleaned and an additional charge of 10 cents will be made for each receptacle so emptied.

SEC. X. All privies existing or maintained in said city after the date on which this ordinance takes effect which do not comply with the requirements of this ordinance or the regulations of the city health officer issued under this ordinance shall be and are hereby declared a nuisance dangerous to the public health, and the city of Tuscaloosa shall proceed to abate such nuisance in accordance with law or the ordinances of said city.

SEC. XI. The city shall have the further right to make or cause to be made such alterations or constructions to such privies as are nuisances as will render them sanitary, and the entire cost of such work shall be charged against the person creating or maintaining the same. All such alterations or constructions are to be prescribed and approved by the city health officer.

SEC. XII. All receptacles for sanitary privies in Tuscaloosa shall be furnished by the city of Tuscaloosa, but the same shall remain the property of said city. It shall be unlawful for any person to take. destroy. or misplace, or misuse any of such receptacles.

SEC. XIII. The health officer of the city of Tuscaloosa or a duly appointed inspector shall personally inspect all privies in Tuscaloosa as such inspection shall be deemed necessary by such health officer or inspector. The city health officer or a duly appointed inspector is hereby empowered to enter all premises in the discharge of this duty.

SEC. XIV. It shall be unlawful for any person to fail or refuse to comply with the provisions of this ordinance.

SEC. XV. Any person who violates any of the provisions of this ordinance or the regulations issued by the city health officer, or any person who in any way obstructs the city health officer or his duly authorized agents or the scavanger in the proper discharge of the duties prescribed in this ordinance, shall upon conviction be fined in a sum not more than $100, and may also be sentenced to hard labor for the city for a period of time not exceeding six months.

Sec. XVI. That all ordinances or parts of the same in conflict with the provisions of this ordinance are hereby repealed.

Sec. XVII. This ordinance shall become effective on the 15th day of May, 1916.

Maysville, Ky.

An ordinance providing for the proper disposal of human excreta in the city of Maysville; defining the terms; declaring insanitary privies a nuisance; providing for the use, construction, scavenging, maintenance, and inspection of sanitary privies; fixing the penalty for the violation of the provisions of this ordinance, and repealing other ordinances or parts of ordinances in conflict hereto.

Article I. Providing for the sanitary method of disposing of human excreta enjoined upon owners of premises.

Section 1. That on and after ———[1] every residence and building equipped with toilet facilities in which human beings reside, are employed, or congregate shall be required to have a sanitary method for the disposal of human excreta, namely, sanitary water closet or closets or a sanitary privy or privies.

Sec. 2. That it shall be unlawful for any person or persons, firm, or corporation owning property within the city of Maysville, Ky., to permit the disposal of any human excreta on any property owned by such person or persons, firm, or corporation, except in a sanitary water closet or closets, sanitary privy or privies, of sufficient capacity to accommodate the occupants thereof at all times.

Sec. 3. Any building as defined in section 1 of this article within a sewer district shall be required to connect therewith a sanitary water closet or closets.

Sec. 4. A sewered district, as that term is used in this ordinance, includes the property which is accessible to any public sewer in the city of Maysville by virtue of such property being bound on any side by any street or alley along which extends such public sewer or any extension thereof and includes also the property which is accessible to any such sewer by virtue of such sewer or any extension thereof touching any portion of such property.

Sec. 5. Should any property not in a sewered district when this ordinance becomes effective afterwards become a portion of a sewered district by virtue of the construction of a new sewer line, or the extension of an old one, in such a manner to include such property within the definition of a sewered district, as set out in section 4 hereof, then the persons mentioned in section 2 hereof, upon whom this ordinance imposes duties with reference to such property, shall have 90 days after such property becomes a portion of a sewered district within which to connect any privy or water-closet situated on such property with such sewer.

Sec. 6. That no septic tank nor Kentucky sanitary privy shall be constructed within the incorporate limits of the city of Maysville without a permit from the board of health to do so.

Article II. Operation of ordinance.

Section 1. That the cost of providing for a sanitary method of disposal of human excreta shall be borne by the owner of the property upon which the sanitary water closet or closets, sanitary privy or privies are located.

Sec. 2. That all cans used in the boxes for the catchment of human excreta are to be furnished by the city of Maysville and at all times shall remain the property of and be under the control of the city of Maysville.

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[1] Date ordinance was to become effective was left for action of newly elected council, which was to take office Dec. 1, 1917.

SEC. 3. That the office of town scavenger is hereby created, who shall be appointed by the board of council for a term and at a salary to be fixed at the time of such appointment, whose duties will be to clean the said sanitary privies at least once every seven days and oftener if necessary, preferably in the daytime, as follows:

The cans shall be removed from the privy box, covered with tightly fitting lids; clean cans shall be replaced in the privy box, and the contents of the filled cans disposed of by transfer to the disposal stations, after which the cans shall be washed and a pint of disinfection solution put into them.

SEC. 4. That for the cleaning of each privy a fee of $1 per quarter, payable in advance, shall be charged and paid for by said owner for each can scavenged, provided that for each privy containing more than one receptacle an additional fee of 50 cents per quarter, payable in advance, shall be made for each additional receptacle.

That the fees or charges set out in this section shall be paid by the owner of said premises at the office of the city collector and treasurer at the beginning of each quarter.

SEC. 5. That no can shall be allowed to become filled to overflowing in privy, as herein provided, and when the same is in danger of becoming filled to overflowing, it shall be the duty of the occupant of any premises to notify the city scavenger to remove the same at any time such condition arises, for which an extra charge of 25 cents shall be made against the occupant when removed other than at the regular period for the removing of same.

SEC. 6. That all privies shall be kept clean at all times; that the cover of the seat of the said privies shall be kept closed at all times when said privy is not being used; that no wash water, kitchen slops, or anything other than human excreta, toilet paper, and disinfectant shall be emptied in the said privy; that no excreta from any person suffering with typhoid fever, dysentery, or other serious bowel disease shall be deposited in any sanitary privy or sanitary water-closet unless the same shall be disinfected in such a manner as may be prescribed and approved by the board of health, city physician. or any health officer thereof.

SEC. 7. That the city scavenger or any employee working under him shall report to the board of health any violation by any property owner or occupant of any property within the said city of this ordinance, and it shall be the duty of any property owner or any occupant of premises within said city to report to the board of health the negligence of the city scavenger or any of his employees to comply with any of their duties as provided in this ordinance, and the board of health or the mayor of said city, or anyone so empowered, shall take such action thereon as he shall deem best for the public health of the inhabitants of said city.

ARTICLE III. DECLARING ALL PRIVIES NOT CONSTRUCTED AND MAINTAINED AS HEREIN DESIGNATED TO BE A NUISANCE.

SECTION 1. That all privies on any premises within the incorporate limits of the city of Maysville, Ky., not constructed and maintained in conformation with the provisions of this ordinance after this ordinance takes effect shall, and hereby are, declared to be a nuisance.

ARTICLE IV. Definition of terms.

SECTION 1. Human excreta: That the term "human excreta," as used in this ordinance, shall be construed to mean the bowel and kidney discharge of human beings.

Sec. 2. Sanitary water-closets: That the term "sanitary water-closet," as used in this ordinance, shall be construed to mean any flush-type toilet which is connected with a sewer line of sufficient capacity and so constructed as to carry away the contents at all times.

Sec. 3. Sanitary privy: The term "sanitary privy," as used in this ordinance, shall be construed to mean a privy which is built, rebuilt, or constructed so as to contain a privy box, which box shall conform to the following specifications:

(A) The privy boxes shall be of either the single or the double type; the double type to be installed in any privy used by more than five persons.

(B) The privy boxes shall be constructed of durable lumber and shall be fly tight.

(C) The single-type privy box shall be 22 inches long, 17 inches high, and 18 inches wide, all inside measurements, and shall be provided with one seat hole about 9 inches long, the front of which shall be about 4 inches from the front of the box.

(D) The double-type privy box shall be 40 inches long, have two seat holes, and otherwise similar to the single-type box.

(E) All privy boxes shall have nine 1-inch holes in the front of the box, 2 inches from the floor, and shall have an opening at the upper part of the back wall 4 inches square, all of these openings to be covered with galvanized-iron screen wire at least 14 mesh to the inch.

(F) Under each seat hole shall be placed a galvanized-iron receptacle, circular in shape, with straight sides about 15 inches high and about 15 inches in diameter, made of 24-gauge galvanized iron. These receptacles shall be so placed as to catch all human excreta deposited in the box, being held in place by a strip of wood tacked to the floor.

(G) The top of the privy box shall be hinged with metal hinges, so as to allow for the removal of the receptacles, and so as to fit flat on the top of the box at all other times.

(H) Each seat hole shall be provided with a cover or lid hinged with two spring hinges so as to fall into place when not being used, and which shall at all other times be kept closed, so as to prevent the access of flies to the human excreta.

(I) A flue not less than 4 inches square or 5 inches in diameter shall extend from the opening in the back of the privy box to 12 inches above the roof of the privy. The top of this flue shall be covered, so as to prevent rain from entering the privy box but allowing free egress of air for ventilating purposes.

Article V. Penalty.

Section 1. That any person or persons, who neglect, fail, or refuse to comply with any of the provisions of this ordinance shall be deemed quilty of a misdemeanor, and when convicted shall be fined in the sum of not less than $10 or more than $100, and each day such person or persons neglect or refuse to comply with any of the provisions of this ordinance after notice so to do shall be deemed a separate offense and punished as herein provided.

Sec. 2. Any ordinance or parts of ordinances in conflict herewith are hereby repealed. This ordinance shall be in full force and effect from and after its passage and publication, and shall be operative on and after the ——[1] day of ——.

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[1] Date ordinance was to become effective was left for action of newly elected council, which was to take office Dec. 1, 1917.

APPENDIX B.

RESOLUTIONS IN REGARD TO SURVEYS.

By official and civic organizations and by prominent individual citizens in the counties surveyed, numerous formal resolutions have been adopted and numerous letters written commending the work of the National Government in rural sanitation.

The following are fair samples:

STATE OF WEST VIRGINIA,
County of Berkeley, ss:

I, A. E. Hobbs, clerk of the county court of the county and State aforesaid, do hereby certify that at a special session of the county court of Berkeley County, W. Va., held at the courthouse thereof on the 18th day of January, 1915, the following order was entered upon the minutes thereof:

"In the matter of inspection of sanitary conditions of Berkeley County by the United States Public Health Service:

"Whereas in the selection of counties for the purpose of demonstrating the feasibility and necessity of sanitation, the United States Public Health Service designated Berkeley County as one of them,

"*Resolved*, That the county court of Berkeley County express its appreciation of the distinction thus conferred and of the earnestness, thoroughness, and intelligence with which the excellent work was carried on, and of the merit of the work as clearly proven in the lower rate of typhoid fever and other contagious diseases.

"Also, the court expresses its approval of the work as a whole as the most progressive step taken for the conservation of the public health.

"And the clerk of this court is directed to send a copy of these resolutions to the head of the United States Public Health Service."

In testimony whereof I have hereunto set my hand and affixed the seal of said court this 19th day of January, A. D. 1915.

[SEAL.] E. A. HOBBS, *Clerk.*

CITY OF MARTINSBURG,
EXECUTIVE DEPARTMENT,
Martinsburg, W. Va.

Whereas a sanitary survey having been made of the city of Martinsburg under the direction of the United States Public Health Service; and

Whereas the survey, we believe, has proved of incalculable benefit to Martinsburg, and the information imparted to our citizens has enabled them to improve the sanitary condition of their homes, so that they are better able to combat the spread of any infectious or contagious disease in our midst: Now, therefore, be it

Resolved, That the council of the city of Martinsburg express to Dr. Lumsden, Dr. Bryan, and their associates of the United States Public Health Service the thanks and appreciation of the council for their zealous and painstaking work to better the sanitary conditions of this city; and be it further

Resolved, That copies of these resolutions be presented to Dr. Lumsden and Dr. Bryan, and that they be spread upon the minutes of the council.

A true copy from the records.

Attest:

[SEAL.] P. W. LEITER, *Recorder.*

The Community Club of Berkeley County,
Martinsburg, W. Va., November 28, 1914.

Surg. Gen. Blue,
United States Public Health Service,
Washington, D. C.

My Dear Sir: We, the members of the Community Club of Berkeley County, W. Va., desire to express to you and your coworkers our hearty thanks for the splendid work done in our county. We appreciate the honor conferred upon us in that you selected our county for your pioneer work in the sanitation of the country districts. The effects of this work are far-reaching, and we are experiencing its valuable results already in the decrease of sickness directly due to unsanitary surroundings.

We owe you and the gentlemen whom you sent to carry on the work a debt of gratitude—Dr. Lumsden for planning the work; also Dr. Bryan and his assistants, who were untiring in their efforts to make the experiment successful.

Again thanking you, we are,

Very sincerely,

The Community Club,
Mrs. H. S. Shade,
Corresponding Secretary.

RESOLUTION OF MITCHELL COMMERCIAL CLUB, MITCHELL, IND.

Whereas the Mitchell Commercial Club is well acquainted with the work of Dr. L. L. Lumsden, of the United States Public Health Service, and his assistants; and

Whereas the Mitchell Commercial Club, after careful study of the work, is thoroughly convinced that the city of Mitchell and Lawrence County have been brought to a higher plane along the line of sanitation and that the public health has been benefited to the extent that the scourge of typhoid fever has been almost eliminated from our city, and that the people have been awakened and educated to a fuller realization of the value of observing all sanitary laws and rules leading to a higher regard for the health of the people; and

Whereas the work of Dr. Lumsden has been managed with such skill and care that the people have willingly and heartily followed his suggestions and stand pledged to continue the work: Therefore be it

Resolved, That the Mitchell Commercial Club most heartily indorse the work done here by Dr. Lumsden and his associates, and takes this method of expressing its appreciation of his efforts in the cause of better health and greater happiness for our people.

The Mitchell Commercial Club,
Per Kelsa F. Bortorff, *President.*
John A. Rodarmel, *Secretary.*

Bedford, Ind., *November 26, 1914.*

The Surgeon General, United States Public Health Service,
Washington, D. C.

Dear Sir: At the regular meeting of the Bedford Community Club it was moved and passed that the club express to you its appreciation and thanks for the work of your officers in Bedford and Lawrence County during the past summer under the direction of Dr. L. L. Lumsden. We realize the need and importance of the sanitary work in which they have been engaged and consider it a mark of special consideration for Lawrence County that it was selected for such a campaign. We feel that great benefit has been derived from the work of your men in this community. The Community Club, which was organized by the ladies of Bedford at the suggestion of Dr. Lumsden, now consists of over 1,000 members, and we hope to be able to continue the work for sanitation, to which our attention has been directed by your men.

Very respectfully,

Katherine C. Whitney,
President of the Community Club.

New Albany, Miss., *November 24, 1914.*

Surg. Gen. Rupert Blue, M. D.,
Washington, D. C.

Dear Sir: Below you will find resolution adopted by the Union County Medical Society, State of Mississippi.

Resolved, That each and every member of the Union County Medical Society, State of Mississippi, sincerely appreciates the good work done in this county or the eradication of typhoid fever by the United States Public Health Service, most ably represented by L. L. Lumsden, M. D., and a corps of competent ssistants.

All work assigned to them was exceptionally well done, and we are sure that ood results will multiply from their excellent teaching.

Union County Medical Society.
H. N. Mayes, *President.*
E. Hayes Wesson, *Secretary.*

New Albany, Miss., *December 1, 1914.*

Whereas Surg. L. L. Lumsden, United States Public Health Service, Washington, D. C., in charge of field force, who has been in our city for several months, having come here for the purpose of giving information to our citizens on the subject of sanitation, and thus helping to improve sanitary conditions in the city and Union County; and

Whereas this field force has been active, energetic, and faithful in their work and has been of great material benefit to the city and its citizens in the information given and the work done; and

Whereas the members of this field force, during their duty among us, have been courteous and affable and have in every way conducted themselves in such a manner as to get, as well as deserve, the good will and esteem of our citizens: Therefore be it

Resolved, By the mayor and board of aldermen of the city of New Albany, Miss., that the thanks of said board be extended to the Public Health Service, hrough Dr. L. L. Lumsden, for the good work done by them.

Done in the regular session this December 1, 1914.

W. S. Parks, *Mayor.*
S. W. Bevill, *City Clerk.*

Executive Department,
Annapolis, Md., November 25, 1914.

Hon. William G. McAdoo,
Secretary of the Treasury,
Washington, D. C.

Sir: Some time ago I joined the State department of health in a request to ave a demonstration in rural sanitation made by the United States Public Health Service in one of the counties of Maryland. This request was granted, nd, in consequence, a survey of Dorchester County, Md., was begun on July and completed on November 15. It thus becomes my pleasant duty to express the thanks of the State of Maryland to the Department of the Treasury f the United States for the valuable service rendered to the people of Mary-nd in this survey of Dorchester County.

Surg. Lumsden and his subordinates, Asst. Surgs. Laughlin, Wheeler, and Miller, by their personal qualities and professional skill commended themselves o the people of Dorchester County and effected such changes as can hardly ail to improve the health conditions of the county.

The State department of health was able to detail several men to take part n the survey, and I am informed by that department that the presence and ctivities of the Federal officers in Maryland resulted in definite improvement f the public health service of the State.

For all these please accept my heartiest thanks, and if this expression of ppreciation can be made known to the Surgeon General of the United States Public Health Service I shall consider it an additional favor.

Very truly, yours,

P. L. Goldsborough, *Governor.*

State of Maryland,
Department of Health,
Baltimore, Md., November 20, 1914.

Surg. Gen. Rupert Blue,
United States Public Health Service,
Washington, D. C.

Dear Sir: At the last meeting of the State board of health the secretary, Dr. Fulton, reported the conclusion of the Dorchester survey and the return of your officers to Washington. We understand that Dr. Lumsden is pleased with the results of his operations there and that he intends to return next spring for a reexamination of the results.

It is my pleasant duty to express the gratitude of the board and of the department of health, on account of the services of Dr. Lumsden, Dr. Laughlin, Dr. Wheeler, and Dr. Miller, and to make at the same time a kind of report on certain benefits issuing from the activity of your officers in Dorchester County but not contemplated by you in making their detail.

At the time you undertook this survey the board had in hand the difficult task of dividing the State into 10 sanitary districts and supplying each district with a trained official having the title "deputy State health officer." In the survey undertaken by Dr. Lumsden we had an opportunity to place under his command a group of men who were under consideration and also in preparation for these positions. We were able to assign seven men to duty in Dorchester County and to put them through a course of heavy duty in rural sanitation of the superior kind which Dr. Lumsden has so happily developed. The secretary of the board was able to observe the character and conduct of these men in action both individually and under direction. The men themselves had every opportunity to know each other well, to obtain a very definite sense of their separate and joint responsibilities, to become acquainted with some of the men and some of the methods of the United States Public Health Service, and, what is most important, to study one political division of the State better, much better, than any other division of the State has been studied. For four months they worked under skilled supervision, not with passive materials but with the active and often refractory wills of the people. This unusual discipline we believe was an important preparation for the work which these men will do in the counties of Maryland.

Over and above our indebtedness to the Public Health Service on account of the survey we wish to acknowledge this collateral benefit and to give special credit to Dr. Lumsden, Dr. Laughlin, Dr. Wheeler, and Dr. Miller for the spirited way in which they handled this phase of the undertaking.

For the survey itself we have to say that it appears to have inaugurated, and to be likely to confirm, a radical and universal change of custom with respect to the disposal of human waste. We are inclined to believe that a considerable reduction of morbidity, in Dorchester County, during the current year, is fairly attributable to the survey, and in 1915 we hope to present proof that the survey has fulfilled this, its essential purpose.

In conclusion, accept our assurance that any and all visits of yourself or of your officers for the purpose of continuing or reviewing the work in Dorchester will be most welcome.

Yours, very truly,

William H. Welch, *President.*

Dorchester County Medical Society,
Fishing Creek, Md., May 1, 1915.

At the annual meeting of the Dorchester County Medical Society the following resolution was adopted:

"We, the members of the Dorchester County Medical Society, desire to put ourselves on record in the minutes of this meeting as expressing our satisfaction and approval of the accomplishment of the sanitary survey of Dorchester County, Md., by the United States Public Health Service and the Department of Health of Maryland.

"We deem it necessary to the health of the community that such sanitary surveys be made in each county, city, and town in the Nation."

It was directed that a copy of this minute be sent to Surg. Gen. Blue, United States Public Health Service, and Dr. John S. Fulton, secretary of the Department of Health of Maryland.

Guy Steele, *President.*
W. H. Houston, *Secretary.*

DORCHESTER COMMUNITY SANITATION LEAGUE,
Cambridge, Md., November 16, 1916.

SURGEON GENERAL UNITED STATES PUBLIC HEALTH SERVICE,
Washington, D. C.

DEAR SIR: The president of our sanitation league has asked me to write you of our appreciation of what the United States Public Health Service has done for our county and State in the health survey just completed. Any help in lessening the ravages of our most dreaded and dangerous disease would have been the cause for thankfulness, but such aid as you have given us merits our deepest gratitude. The women of the Dorchester Community Sanitation League feel that the way in which we can best show that gratitude is by continuing the work you have so splendidly started until Dorchester County is a model of sanitation, and we will certainly endeavor to do just that. We are trusting that the men in authority in the county and its various towns are feeling the same way about this matter, and the Dorchester Community Sanitation League stands ready to "hold up their hands" in their every effort toward complete sanitation.

We think we have been very fortunate in the officials in charge of our survey. It has been a privilege and a pleasure to work under the direction of Dr. Lumsden and Dr. Laughlin.

Assuring you of our continued and earnest efforts to carry on to completion all their plans for the sanitation of Dorchester County and its towns, we are,

Most respectfully, yours,

M. BLANCHE NOBLE,
Secretary Dorchester Community Sanitation League.

THE CAMBRIDGE BOARD OF TRADE,
Cambridge, Md., November 16, 1916.

The SURGEON GENERAL, UNITED STATES PUBLIC HEALTH SERVICE,
Washington, D. C.

DEAR SIR: A sanitary survey of Dorchester County, Md., of which county Cambridge is the county seat, was begun July 9 and completed this week. This survey was made under the supervision of Drs. L. L. Lumsden and J. B. Laughlin, of your department. People not only of the city of Cambridge, but of this entire county, consider this survey a great blessing to our people and are grateful to your department for having done this great work for the betterment of the health of this county.

When the matter of this survey was presented first to our people some regarded it with some misgiving, fearing it would furnish some unpleasant advertising, but they quickly realized the purpose was good and that the results must be the same. Our newspapers and leading citizens welcomed the survey and cooperated with the physicians in charge of the work to make it a success. Every incorporated town in the county asked for, desired, and got the survey. A delegation of business men, representing the Cambridge Board of Trade, appeared before the Cambridge council and urged a sanitary survey and clean-up for Cambridge, even at the price of paying the cost themselves, individually, and the town council decided unanimously for the clean-up and voted the necessary money for same.

The sanitary survey completed this week in Dorchester County is a great success. The public health of our county already has been improved and our people have learned how to keep clear of filth diseases. The good work has not been in vain; already good results are in sight and better things are sure to follow.

The Cambridge Board of Trade is an organization devoted to the advancement of the best interests of Cambridge and Dorchester County. Among its membership are about 200 representative citizens of this county. One of them is the governor of this State and another is comptroller of our State treasury.

The Cambridge Board of Trade voices the sentiment of the Dorchester people in expressing to you our sincere assurance of appreciation of the sanitary survey of Dorchester County.

In this connection it affords me great pleasure also to state that our people hold in high esteem Drs. Lumsden and Laughlin, the representatives of your department who led in this work, and we believe much of the success of this work is due to their personalities and indefatigable labors.

I have the pleasure to be,

Very sincerely, yours,

VERNON S. BRADLEY,
President Cambridge Board of Trade.

RESOLUTIONS ADOPTED BY BOARD OF COUNTY COMMISSIONERS OF WALKER COUNTY, ALA.

Whereas representatives of the United States Public Health Service have just completed an intensive survey of Walker County, Ala.; and

Whereas this work has been so efficiently carried into every section of the county, the benefits of which are already highly gratifying and will continue to accrue; and

Whereas we are in hearty sympathy with our health department in its efforts to make Walker County a nucleus of good health for this entire section: Be it

Resolved, First, that as a board of county commissioners we indorse the work that has been done by the representatives of the United States Public Health Service in Walker County; second, that we take this means of expressing our appreciation of the work, sending copies of these resolutions to the Surgeon General of the United States Public Health Service, and to Surg. Lumsden, who has been in direct supervision of local activities; third, that we earnestly solicit the continued interest and cooperation of the Public Health Service in Walker County, Ala.

CHAS. M. SARTAIN,
Judge of Probate.
F. J. MORRIS,
J. J. GRACE,
J. M. ROQUEMORE,
J. E. BURTEN,
Board of County Commissioners for Walker County, Ala.

WALKER COUNTY BOARD OF HEALTH,
Jasper, Ala., December 4, 1915.

The SURGEON GENERAL UNITED STATES PUBLIC HEALTH SERVICE,
Washington, D. C.

DEAR SIR: Some time last winter I addressed to you a formal request, asking that you detail Surg. Lumsden and some of his assistants to make a sanitary survey of Walker County, Ala. This request was granted and the survey has been made, and I am now attempting to write you a note of thanks for the service that has been rendered Walker County. I am sure that you have had full reports of this work from your own men, but I want to report, as a doctor and as the health officer of Walker County, that the real service rendered Walker County especially, and this section of the South generally, can never be estimated. We feel that though it blazed the path, even now there is a tremendous procession following. Our people believe in the principles enunciated. The manner in which your representatives did this work invited the cooperation of the doctors and all other classes of people, and there is now in Walker County a growing sentiment for better health conditions. The work was certainly worth while.

Again assuring you of our genuine appreciation of the work which your service has rendered us,

Yours, very truly,

CARL A. GROTE, *County Health Officer.*

RESOLUTIONS ADOPTED BY WALKER AND WINSTON COUNTIES MEDICAL SOCIETIES.

The following resolutions were read and unanimously adopted by the Walker and Winston Counties Medical Societies at their annual meeting at Nauvoo, Ala., on Friday, August 13, 1915:

Whereas the United States Public Health Service is, with a large corps of efficient doctors under the direction of Dr. Lumsden, making a sanitary survey of Walker County; and

Whereas we believe the good results of this work will be felt throughout the coming generation; and

Whereas we keenly appreciate the character of this work: Therefore be it

Resolved, That we heartily indorse the work on rural sanitation now being conducted in Walker County by the United States Public Health Service. That we regard this line of work as one of the most important in which our National Government can engage. That it is the sense of this meeting that this work should be rapidly extended into all parts of the United States. That copies of these resolutions be sent to the Surgeon General of the United States Public Health Service and be written into the minutes of this society and be published in our county newspapers.

ORANGE COUNTY,
SUPERINTENDENT OF PUBLIC INSTRUCTION,
Hillsboro, N. C., December 28, 1915.

Surg. Gen. RUPERT BLUE,
Washington, D. C.

DEAR SIR: The Board of Education of Orange County, N. C., in session November 1, passed the following:

"*Resolved*, That whereas the United States Public Health Service has rendered an invaluable service to the people of Orange County, not only in effecting much better sanitary conditions, but also in educating our people along health lines and establishing a public health conscience, we, the members of the county board of education, wish to express to Surg. Gen. Rupert Blue and his agents in this work our sincere appreciation of this magnificent effort and to pledge our hearty and active support in the continuance of health work by local authorities."

The board of education on November 1 also strongly recommended to every school committee the building of two sanitary privies at every schoolhouse in Orange County. This recommendation is to follow up the action taken some time ago by the board of education providing for one-half of the expense of construction of these privies, to be paid out of the building fund of the county.

Very truly, yours,

S. P. LOCKHART,
County Superintendent.

RESOLUTIONS OF THE INTERCHURCH ASSOCIATION, HILLSBORO, N. C.

At a meeting of the Interchurch Association, held the evening of Monday, October 25, 1915, the following resolutions were adopted unanimously:

1. It is with regret that we realize that the United States health survey of the county is drawing to a close. The gentlemen connected with, or having charge of it, have been so earnest, enthusiastic, and efficient in their work, have had so much personal charm and tact, that even if results have not come up to reasonable expectations the fault is in us and not in them. We bid them, then, Godspeed, and assure them that their stay among us has been a blessing to the county, as well as to the community in which we live, whatever the apparent and immediate results may be.

2. We pledge ourselves, as individuals and as an organization, to assist in any way we can in carrying on the good work which they have so capably and enthusiastically initiated.

By order of the association.

JOHN WARD, *President.*
JAMES W. CHESHIRE, *Secretary.*

[From the University of North Carolina News Letter.]

A WONDERFUL SANITARY SURVEY.

CHAPEL HILL, N. C., *November 10, 1915.*

During the last six months six field officers of the Federal Health Service have been visiting and revisiting 3,250 homes of Orange County.

They have been investigating the conditions affecting disease, sickness, and death in these homes, water supply, the toilet facilities, the disposal of human body waste, the breeding places of disease-carrying insects, the screening against flies and mosquitoes, and so on.

They have scattered bulletins far and wide about the origin and nature of typhoid fever and other intestinal diseases—dysentery, diarrhea, hookworm, cholera infantum, and the like. They have pointed out the simple, effective things to do in order to abolish typhoid and to save the 65 children who die in Orange year by year before they are five years old, most of them from preventable diseases.

They have held 80 public meetings and given illustrated lectures to 6,000 people in schools and churches all over the county. No more searching, stimulating health campaign has ever been conducted anywhere in the United States.

ASTOUNDING REVELATIONS.

The civilization of Orange County is 162 years old, and there are no better people on earth. The disclosures of this survey simply show how sensible, good people can habitually neglect the commonest safeguards of health and life—the health and life of loved ones in their own home circles.

In the 2,085 country homes the surveyors found not a single family that tried to prevent the breeding of flies in manure piles. They found only two sanitary outhouses. They found 1,605 dwellings totally unscreened and 1,292 homes, or more than three-fifths of them all, with no surface closets or other toilet facilities.

In the 773 town homes they found 645 dwellings with insanitary surface closets, 653 families depending on wells and springs, and 358 with totally unscreened homes.

In these 773 town homes they found histories of 301 typhoid fever cases and altogether 1,188 cases of typhoid fever in the homes of the county during the last 25 years.

The same kind of searching examination would show similar or worse conditions in any other county in this and every other State. Orange is not worse than other counties, but Orange now knows better than 3,000 other counties of the United States the necessity of safeguarding the home circle against preventable diseases and the ways in which to do it simply and inexpensively.

THE RESULTS TO DATE.

When the people of Orange County were brought face to face with these amazing conditions they began to act promptly.

The towns have all passed ordinances requiring sanitary surface closets, and the weekly disposal of human body waste in sanitary ways under the direction and inspection of health officers.

On the second round of visitation the surveyors found 35 per cent of the country homes with sanitary surface closets already built, and almost all the rest arranging to provide them.

The school board appropriated money to help in building sanitary outhouses for the schools, and the superintendent, the district trustees, and the teachers are alive to the necessity for fly-proof closets with water-tight receptacles, and the weekly disposal of contents.

The Federal Health Service is wise enough to know that, simple as these things are, no community scores a hundred in sanitary matters in a jiffy; and that time is required for the full measure of results.

And the people of Orange are wise enough to go on to the very end now that they have started to clean up thoroughly.

It is encouraging to know that the 160 typhoid cases in 1914 dwindled to 19 this year; and the death rate from 8 to 2.

The county is getting ready to have a whole-time health officer and to lead the United States in freedom from preventable, postponable diseases and deaths.

GREENVILLE, S. C., *May 11, 1916.*

HON. E. D. SMITH,
United States Senate, Washington, D. C.

DEAR SIR: For some weeks I have been coming in contact with the United States Public Health Service doctors, who are making a survey of Greenville County. I have been at three meetings which they conducted, two of which were in communities where I am the Baptist pastor. They have also made a survey of one of them and also of my home community. This has given me an idea of the work they are doing and meanwhile I have become acquainted with several of the men.

For my opinion this is one of the greatest works our great Government is undertaking. You all, through this service, are teaching us both how to live and how to let live. Surely no one can hear these doctors without realizing anew that he is his brother's keeper. The noble response to their suggestions, which I find everywhere I follow them, is indeed laudable. I know of numerous instances where immediate response has been made by both farmers and the people in the towns. This alone will show you how this service is appreciated. And no doubt the success with which this survey is meeting will encourage more extensive undertakings in the future.

The survey is not only a success because the people realize the need of it, but because of the class of men who are conducting it. They are noble representatives of our ideal of government officials. They are congenial; they are manly; they are gentlemen. Every home I have visited after their visit I have heard expressions like these: "They are well informed." "They sure can tell you something." "They are so plain and manly in the presentation of their work." "We believe in their work." "They are fine men." "I will do my part." "I wish they had told me about other diseases," and "I hope they will visit my home again."

I believe that I voice the sentiment of the people I serve when I thank you and others for sending these men here.

Yours, truly, J. A. HUNNICUTT.

GREENVILLE, S. C., *October 21, 1916.*

The SURGEON GENERAL, UNITED STATES PUBLIC HEALTH SERVICE,
Washington, D. C.

DEAR SIR: I have watched with interest the sanitary survey which has been conducted in our county of Greenville by the representatives of your department.

Please permit me to express my great appreciation for what has been done by these gentlemen. They have awakened our people to the importance of sanitation, and I think the benefits will be incalculable. They have gone about the work in a very tactful manner, and the results have not only been accomplished without the least friction but, on the contrary, your representatives leave here with many friends, and general expressions of regret are heard at their departure.

The city of Greenville has not had a single case of typhoid fever to originate within its corporate limits for the past 18 months, due to improved sanitation, good water, and other laws regulating food supplies sold here. From the last report of the county health officer it appears that typhoid fever has been markedly reduced this year.

Health day, which was celebrated here on October 4, was a demonstration of the awakening of our people for improved health conditions.

Any county fortunate enough to receive a sanitary survey by your department would welcome the honor, I am sure. I hope that our Senators and Representatives will learn more about the good the United States Public Health service is doing and make it possible for every county to enjoy a sanitary survey.

As a citizen of Greenville, I appreciate the compliment paid our community by selecting it to be visited by your service.

Yours, very truly, WM. G. SIRRINE.

STATE OF ILLINOIS, STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
Springfield, December 6, 1916.

Dr. L. L. LUMSDEN,
United States Public Health Service,
Washington, D. C.

MY DEAR DR. LUMSDEN: We are hearing many favorable comments on the work in Cumberland County, and as a result of your good work we are being swamped with a flood of requests to conduct similar surveys in other counties, townships, and municipalities of the State.

I am, of course, highly gratified to note the extent to which intelligence has been awakened throughout the State by the work done in Cumberland County, and I feel that in this you have rendered us a service of quite incalculable importance. My one regret is that we are not now in a position to meet the demands for a similar service in the awakened communities. Neither our force nor our appropriations will permit the undertaking. I am, however, including an item for sanitary surveys in the budget which will be presented to the general assembly in January, and with the demands of the awakened communities to back us up we should be successful in securing some money for such purposes.

Is it your intention to publish a report of the Cumberland survey in the near future? If not, would it be possible for you to write a brief summary of the work, its aims and purposes, for publication on our monthly bulletin—"Illinois Health News"?

If you can furnish such a summary, I shall be pleased to have it run in the Bulletin, and in addition will have a large number of reprints struck off for your use and for ours. If you can supply photographs or drawings from which cuts can be made we will gladly defray the expenses.

Very sincerely, yours,

C. ST. CLAIR DRAKE, *Secretary.*

APPENDIX C.

STORY USED IN EDUCATIONAL WORK.

The following story, written by Quintard Taylor, field investigator, United States Public Health Service, while a member of the survey force in 1915, has been published in a large number of local newspapers in the counties surveyed:

ME AND MAGGIE AND THE BOY.

Yes; I reckon 'twas just about four years ago. I was livin' down in Orange County then and had as fine a little farm as there was in the State. Maggie and the boy was alive then, and our little home was just about as happy a place as you could find on this side of Jordan. Me with as fine health as man ever boasted of, havin' good luck with my crops, too, and everything goin' as fine as a fiddle, and my place all paid for and nothin' to do 'cept enjoy livin' as the good Lord intended we should. And how we did enjoy sittin' by that old open fireplace those cold winter nights, me and Maggie and the boy, and just talkin' and dreamin' about how fine it would be when the boy growed up and what we were goin' to make of him and how some day he was goin' to be a great man and how—but, stranger, do you want to hear this story? Well, that was as how things were goin' with me that year—let me see—1915 I 'low it was. No man that ever lived had more to make him happy than I did then, and I was just goin' along like lots of other folks and thought that maybe I wasn't such a bad kind of feller, just as fellers run, and that, after all, this was a pretty good old world to live in.

Well, sir, one night whilst I was readin' the paper and Maggie and the boy just sittin' around I happened to see a piece that some feller had wrote sayin' that the United States Government was goin' to send some health doctors down to our county to do something or other. I didn't exactly make out what they was driving at, but anyhow I didn't pay much 'tention to what it was they was talkin' about, because things was a goin' so fine with me, and the Government fellers are all the time gettin' up some new-fangled business, anyhow. Me and Maggie, we just figured that there wasn't any use takin' up our time with such foolishness as that, and we just went on a cannin' fruit and gettin' ready for the winter just like we had always been a doin'.

It was getting 'round toward early fall time when we was all pretty busy pullin' fodder and makin' sorghum and one thing and another, and things was sure goin' fine with me and Maggie and that boy. Well, sir, we didn't hear anything more about that Government doctor business 'till one day old man Long's boy was a riding by and told me that he heard that them fellers had been down around the mill last week and would probably be gettin' out this way 'long about Monday or Tuesday. And sure enough, Monday mornin' here comes one of them up through the field, all dressed up in some kind of uniform, with leggins on and smilin' and lookin' as cheerful as you please. He said that he was one of the Government doctors and that he just wanted to ask me some questions and talk to me about how to keep from gettin' typhoid fever and how to keep the little fellers from gettin' summer bowel troubles. I 'lowed to him that we had never had no kind of sickness and hadn't took a dose of medicine in over a month, and that I didn't 'spect that he knowed such an awful lot about those things anyway, and that he was most too young lookin' to be goin' around tellin' us older folks about how to keep the children from gettin' typhoid fever. Folks around that country had been havin' typhoid all their lives, and I 'lowed to that young feller that they would keep on havin' it. We hadn't never had no typhoid in our little family, me or Maggie or the boy, and I told him so; but he just kept right on askin' me questions and puttin' 'em down on some kind of card or other. Finally when he got through with that he put his pencil back in his pocket and just lit in to tell me all about typhoid fever, just where it comes from and just what I would have to do to keep from gettin' it. He talked right interestin', that young feller did, and I sort of found myself a listenin' to him. He really seemed to be a right nice sort of chap, and after showing me some things I'd never thought of before about the well and the kitchen windows and the stable and other outhouses he shook hands with me and said he hoped that I could see the common horse sense in the things that he had been tellin' me about, and that I would go ahead and do those things just to protect my family. Then he left me some little books and went on down and got in his buggy and drove on up the road. Well, of course, I wanted to protect Maggie and the boy and myself, and I had already put up lightnin' rods on the house and done all of those things that folks generally does; but I was pretty busy about that time, and I never did get around to doin' just what that young feller said I ought to do, and then there was my tobacco to look after, and somehow or other that young feller and what he told me just slipped out of my mind, and I never thought no more about what he told me until late that fall, and then I thought about him good and proper; and if I had thought more about what he told me at the right time Maggie and the boy would have been with me to-day. But you know, stranger, how some folks is. Well, sir, one evening along in late November the boy, Harry we used to call him, come in complainin' of feelin' bad and havin' a sort of headache. Maggie didn't think that it would amount to much and so just gave him a good dose of oil and put him to bed. The next mornin' he was still ailin' and for about a week he kept gettin' worse and worser, 'till finally I 'lowed we had best send for old Dr. Hendricks. Well, the old doctor got out there tolerable early next mornin' and pronounced Harry's case as typhoid fever, and said that the little feller was goin' to have a hard fight to make it. He left Maggie some kind of medicine to give him, and I tell you what she just waited on that boy and looked after him in such a way as only a mother can look after anybody. Of course, she had to do all the cookin' and housework so as it made it pretty hard on Maggie havin' little Harry sick with typhoid and so helpless. The doctor, he come out to see him every day, and so it just dragged along that-a-way for about three weeks and the boy gettin' weaker and weaker all the time and pickin' at the bed clothes and crying out in his agony and just a sufferin' all the time. Maggie worked herself down to almost nothin' tryin' to care for him and make him comfortable and then the next thing I knowed there she was down in bed. Old Dr. Hendricks pernounced that she had typhoid, too; and he told her how she got it; and then, stranger, for the first time since he had been there two months before I thought about that young Government doctor and what he told me, and I began to feel sort of uneasy and guilty like, and I couldn't sleep none of a night just for thinkin' of Maggie and the boy in there on the bed of affliction and me, with my carelessness, to blame for it all. Of course, I didn't have much heart for to be a doin' anything about the place. The neighbors they was all mighty good and did what they could to help out, but I tell you my farm and stock sure was goin' down hill all the time, and then little Harry died. The night we buried him—poor little feller—Maggie was just almost delirious, and we had to have two more doctors with her, and, stranger, I pray to my Maker that no man will ever have to go through the black night that I did then. Along about midnight it come up a storm, and it was such a storm as you hear folks tell about but hardly ever see; and as we sat there in that little room, all feelin' sort of helpless like, it just seemed to me that God was sort of takin' a hand in things and showin' his wrath at me through the elements. I knew then that I had surely committed an awful sin against God who had sent me Maggie and the boy, and against the world in not protectin' 'em—and along about sun-up Maggie breathed her last. * * *

I stepped right softly to the door and looked out. It was cold and clear and crisp, and I felt a snap of life in the keen air. My God, life and nothin' to live for! I lowered my head and prayed, stranger, and asked God to forgive me my sins and make me a better man and of some use to my fellow bein's; and when I raised up my head and looked down toward the road, there, drivin' out to tell Bill Jones and his Maggie and his boy the same things he had told me, was that same Government doctor.

RELATED PUBLICATIONS.

Available reprints and bulletins on typhoid fever, rural sanitation, water supplies, and sewage pollution issued by the Public Health Service.

Those marked "Exhausted" may be obtained from the Superintendent of Documents, Washington, D. C., at the indicated cost; all others may be obtained without cost from the United States Public Health Service, Washington, D. C.

HYGIENIC LABORATORY BULLETINS.

35. Report on the Origin and Prevalence of Typhoid Fever in the District of Columbia. By M. J. Rosenau, L. L. Lumsden, and Joseph H. Kastle (including the following articles: Sanitary Inspection of Table Waters Vended in Washington, D. C., by Joseph Goldberger; Typhoid Bacillus Carriers, by Joseph Goldberger; The Longevity of B. Typhosus Outside the Human Body, by A. M. Stimson; The Alleged Rule of Intestinal Worms as Inoculating Agents in Typhoid Fever, by Ch. Wardell Stiles; A Sanitary Survey of the Drainage Basin of the Potomac River, by Joseph Goldberger). February, 1907. 361 pages, 9 maps. 7 charts. 2 diagrams. 6 figures. Paper. $1. Exhausted.
44. Report No. 2 on the Origin and Prevalence of Typhoid Fever in the District of Columbia. 1907. By M. J. Rosenau, L. L. Lumsden, and Joseph H. Kastle. 63 pages. 7 maps. 4 charts. Paper. 25 cents. Exhausted.
52. Report No. 3 on the Origin and Prevalence of Typhoid Fever in the District of Columbia. By M. J. Rosenau, L. L. Lumsden, and J. H. Kastle. October, 1909. 160 pages. 10 charts. 10 maps Paper.
56. Milk and Its Relation to the Public Health. (Revised and enlarged edition of Bulletin No. 41.) By various authors. March, 1909. 828 pages. 67 charts and illustrations. Paper. $1. Exhausted.
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    2. Milk as a Cause of Epidemics of Typhoid Fever, Scarlet Fever, and Diphtheria. By John W. Trask.
    3. The Milk Supply of Cities in Relation to the Epidemiology of Typhoid Fever. By L. L. Lumsden.
    17. Sanitary Water Supplies for Dairy Farms. By B Meade Bolton.
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83. Sewage Pollution of Interstate and International Waters, with Special Reference to the Spread of Typhoid Fever. II. Lake Superior and St. Marys River. III. Lake Michigan and the Straits of Mackinac. IV. Lake Huron, St. Clair River, Lake St. Clair, and the Detroit River. V. Lake Ontario and the St. Lawrence River. By Allen J. McLaughlin. March, 1912. 296 pages. 91 charts. 39 maps. Paper. 30 cents. Exhausted.
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PUBLIC HEALTH BULLETIN No. 95
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INFECTIOUS DISEASES OF CHILDREN

A STUDY OF 6,078 CASES AMONG IMMIGRANTS WITH SPECIAL REFERENCE TO CROSS INFECTION AND HOSPITAL MANAGEMENT

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CONTENTS.

Page.
Introduction 5
Part 1. A Statistical study of admissions for all causes for a period of five years 7
I. Sources and causes of admission and case fatality for five years 7
Sources of admission 7
Department of hospital to which patients were admitted 8
Case fatality 9
II. Admissions by age all causes, and deaths by age and principal cause for five years 12
III. Influence of age on incidence and prognosis 16
Measles 17
Scarlet fever 20
Diphtheria 22
Whooping cough 26
Chicken pox, mumps, German measles, cerebrospinal meningitis 26
IV. Influence of season upon incidence and prognosis 29
Measles 29
Scarlet fever 31
Diphtheria 32
Epidemic cerebrospinal meningitis 33
Whooping cough 34
V. Influence of complications and cross infections upon prognosis 34
Deaths by months, principal causes, and complications 35
Deaths by years with principal complications 40
VI. Statistical details of all cases of cross infection for five year 43
VII. Summary of the most important statistical data in its bearing upon the different contagious diseases as personally observed for a period of five years 48
Measles 49
Scarlet fever 59
Diphtheria 62
Whooping cough 69
Cerebrospinal meningitis 72
Part 2. Hospital administration and methods used for the control and treatment of contagious diseases 76
I. General results of methods employed and fundamental principles which govern their successful application 76
II. Description of the hospital 80
General plan of wards and administration buildings 80
The small unit 81
III. Technique of admission, examination, and history taking, nursing, and discharge 83
Admission, examination, and history taking 83
Nursing 85
Discharge 88

Part 2. Hospital administration and methods used for the control and treatment of contagious diseases—Continued. Page.
IV. Special problems connected with hospital management of contagious diseases 89
Practical value or routine throat cultures, antitoxin prophylaxis, and the Schick test 90
Practical value of vaginal smears 91
Practical value of vaccine therapy and prophylaxis 93
Practical value of disinfectant solutions and fumigation 93
Methods of handling food and dishes 95
Methods of handling laundry 96
Diet 97
Visitors 100
Conclusions 100

FIGURES.

1. An isolation ward with small units 82
2. Hand ambulance 83
3. Visitors with cap and gown about to enter wards 100

CHARTS.

1. Influence of season upon the incidence of broncho-pneumonia and the case fatality of measles 30
2. Periodicity of measles epidemics in European cities 51
3. Periodicity of measles epidemics in representative American cities 51
4. Periodicity of measles epidemics in Richmond, Va 52
5. Periodicity of measles epidemics in Cincinnati, Ohio 52
6. Periodicity of measles epidemics among immigrants at Ellis Island 53
7. Proportion of children to adults among arriving immigrants 54
8. Relation of housing to measles 54
9. Incidence and case fatality of broncho-pneumonia in relation to total case fatality of measles 57

INFECTIOUS DISEASES OF CHILDREN.

A STUDY OF 6,078 CASES AMONG IMMIGRANTS, WITH SPECIAL REFERENCE TO CROSS INFECTION AND HOSPITAL MANAGEMENT.

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INTRODUCTION.

Opinion in regard to the proper management of contagious diseases treated in hospitals has undergone much change within the past decade. The old idea that infection occurs through the air and that a distinct quarantine must be drawn between wards and buildings containing patients with different contagious diseases has been gradually abandoned. This bulletin tries to show how in the Ellis Island Hospital the new methods have worked out in practice and suggests changes which will result in additional improvements.

Approximately 75 per cent of all immigration into the United States has for many years been through the port of New York. During the period covered by this report the annual number of persons under 14 years of age has averaged 10 per cent of all arriving aliens. This means that during the periods of so-called normal immigration there have been approximately 100,000 persons passing through Ellis Island every year who were at the age period of susceptibility to the acute exanthemata.

Prior to June 20, 1911, all cases of contagious diseases among arriving immigrants were treated in contract hospitals. Scattered among several different institutions and treated by a different and constantly shifting personnel, these cases could hardly be studied individually or collectively. Since June, 1911, the management of immigrant patients at the port of New York has been solely in the hands of officers of the Public Health Service. The case histories and hospital records have been kept in a way to permit an intensive clinical and statistical study of the principal contagious diseases of children and a careful consideration of the methods found most effective in the hospital management of such cases.

This study naturally divides itself into two distinct though closely related parts. The first deals with the statistics of 6,078 admissions, and embraces data on incidence, age distribution, complications, cross infections, and case fatality, together with a résumé of these and other important factors as they affect the more common acute infectious diseases. The second part deals with the hospital management of the cases, and is a study in methods of prevention of complications and cross infections.

PART 1.

A STATISTICAL STUDY OF ADMISSIONS FOR ALL CAUSES FOR A PERIOD OF FIVE YEARS.

I. SOURCES AND CAUSES OF ADMISSION AND CASE FATALITY FOR FIVE YEARS.

SOURCES OF ADMISSION.

Although all admissions to the hospitals come from the ranks of arriving immigrants, they fall, so far as the epidemiologist is concerned, into three more or less distinct groups. The first group comprise those who are taken sick on board ship and are either reported by the steamship surgeon or are detected by our own examiners at the time of debarkation at Ellis Island. This group is sent, directly to the hospital, either from the immigrant barge or from the primary medical inspection rooms. The second group arises in the general waiting and detention room provided in the administration building for all immigrants who are held for further investigation by the immigration authorities. The third group comprises those who are taken to the general hospital for other diseases and who, while there, develop syptoms of contagious disease. The following table shows the sources of admission by years according to the above mentioned classification:

Table 1.—*Sources of admission, by years, to contagious disease hospital.*

Year.	Source not noted.	From ships and on primary inspection.	From detention rooms	From general hospital	Total.
1912	208	274	185	91	758
1913		621	486	209	1,316
1914		645	299	301	1,245
1915		435	79	167	681
1916		1,686	243	149	2,078
Total, five years	208	3,661	1,292	917	6,078

A striking feature about the foregoing table is the marked diminution in the proportion of cases admitted from the detention rooms during the years 1915 and 1916. During the first three years 28 per cent of the admissions were from this source as contrasted with 11 per cent in the last two years. Although many factors incapable of exact analysis enter into the causation of this marked decrease, the general measures inaugurated by the chief medical officer of Ellis Island during the year 1915 to prevent the spread of epidemic disease, were undoubtedly partly responsible. At this time the practice of taking the temperatures twice daily of all children in the detention rooms and the prompt isolation of those who showed any fever was commenced. This procedure tended to materially lessen both the period of exposure and the number of persons exposed.

More striking than the decrease in the admissions from the detention rooms was that noted during 1916 in those from the general hospital. This was directly connected with a change in the method of handling children with fever from ill-defined or unknown cause which was inaugurated during that year and which will be described in detail in that part of this report which deals with the small isolation unit. (See p. 81.)

DEPARTMENT OF HOSPITAL TO WHICH PATIENTS WERE ADMITTED.

Although this is a contagious-disease hospital, the peculiar relation in which it stands to the immigrant makes it necessary to admit many patients who would be denied admission to any other institution of a similar character.

It is the custom for all nursing infants who are sent to the hospital to be accompanied by their mothers. As the average immigrant mother does not wean her child until well on into the second year and often later, the result is that there is always an appreciable number of accompanying adults admitted who are not sick at all and who have already suffered the contagious diseases of childhood. This forms what is known as the "accompanying" group. These are admitted directly to the wards and units set apart for the contagious diseases.

Another group comprises cases of hookworm, favus, ringworm, or trachoma, or those suspected of having these diseases, admitted at times when empty wards had to be utilized to receive an overflow from the general hospital. These occasions have been rare.

Finally, in the year 1916 all immigrants who were detained for further examinations on account of suspected tuberculosis have been sent as a matter of routine to this hospital. These comprised a third group.

The following table shows the number of patients admitted each year according to the foregoing manner of grouping:

TABLE 2.—*Department of hospital to which admissions were made, by years.*

Year.	I. Patients admitted to contagious disease wards.	II. Relatives accompanying patients to contagious disease wards.	III. Overflow from general hospital (hookworm, trachoma, favus and ringworm).	IV. Admission on account of tuberculosis, actual or suspected.	Total.
1912	633	125	0	0	758
1913	1,160	156	0	0	1,316
1914	1,095	150	0	0	1,215
1915	381	103	194	0	681
1916	974	120	204	780	2,078
Five years	4,246	651	398	780	6,078

CAUSES OF ADMISSION AND CASE FATALITY.

During the five years from 1912 to 1916, inclusive, almost every conceivable contagious disease of children was treated in the hospital. With the changes before referred to in the method of handling children with fever from ill-defined cause, a new class of patients was admitted beginning in 1915, and the character of the hospital then changed from one which handled contagious diseases exclusively to one which admitted and treated every case in which there was suspicion that such a disease might be incubating.

In the following table cases called ''observation'' are those which were suffering from slight digestive disturbance or fevers due to ill-defined cause and who recovered without any specific diagnosis having been made. ''Accompanying relatives'' are for the most part mothers of nursing infants or of very small children from whom they refused to be separated.

TABLE 3.—*Admissions by cause, with deaths by primary cause, and case fatality rates for each disease.*

Cause of admission.	Year.	Number of admissions.	Deaths.	Case fatality.
				Per cent.
Epidemic cerebrospinal meningitis	1912	14	4	28.5
	1913	9	6	66.6
	1914	17	3	17.6
	1915	0	0	0
	1916	4	2	50
Total, five years		44	15	34
German measles	1912	5	0	0
	1913	8	1	12.5
	1914	11	0	0
	1915	1	0	0
	1916	3	0	0
Total, five years		28	1	3.5
Diphtheria	1912	5	1	20
	1913	30	9	30
	1914	9	5	55.5
	1915	6	1	16·6
	1916	20	2	10
Total, five years		70	18	25.7
Whooping cough	1912	8	0	0
	1913	15	1	6.7
	1914	8	1	12.5
	1915	13	1	7.7
	1916	29	4	13.8
Total, five years		73	7	9.5
Chicken pox	1912	27	0	0
	1913	13	0	0
	1914	15	0	0
	1915	15	0	0
	1916	9	0	0
Total, five years		79	0	0
Mumps	1912	0	0	0
	1913	0	0	0
	1914	0	0	0
	1915	6	0	0
	1916	24	0	0
Total, five years		30	0	0

TABLE 3.—*Admissions by cause, with deaths by primary cause, and case fatality rates for each disease*—Continued.

Cause of admission.	Year.	Number of admissions.	Deaths.	Case fatality.
				Per cent.
Smallpox	1912	0	0	0
	1913	1	0	0
	1914	0	0	0
	1915	0	0	0
	1916	0	0	0
Total, five years		1	0	0
Typhus fever	1912	0	0	0
	1913	0	0	0
	1914	3	0	0
	1915	0	0	0
	1916	0	0	0
Total, five years		3	0	0
Erysipelas	1912	0	0	0
	1913	0	0	0
	1914	0	0	0
	1915	1	0	0
	1916	29	1	3.4
Total, five years		30	1	3.3
Measles	1912	502	25	4.9
	1913	834	110	13.0
	1914	841	66	7.8
	1915	185	13	7.0
	1916	252	16	6.3
Total, 5 years		2,614	230	8.7
Scarlet fever	1912	42	5	11.9
	1913	163	50	30.7
	1914	114	22	19.3
	1915	23	1	4.3
	1916	188	10	5.2
Total, 5 years		530	88	16.6
Simple vaginitis and inflammation of vulva	1912	0	0	0
	1913	0	0	0
	1914	0	0	0
	1915	0	0	0
	1916	8	0	0
Total, 5 years		8	0	0
Gonorrheal vulvo-vaginitis	1912	0	0	0
	1913	0	0	0
	1914	0	0	0
	1915	7	0	0
	1916	1	0	0
Total, 5 years		8	0	0
Trachoma	1912	0	0	0
	1913	0	0	0
	1914	0	0	0
	1915	40	0	0
	1916	0	0	0
Total, 5 years		40	0	0
Favus and ringworm of nails and scalp	1912	0	0	0
	1913	0	0	0
	1914	0	0	0
	1915	10	[1] 1	0
	1916	3	0	0
Total, 5 years		13	[1] 1	0
Hookworm and suspected of harboring hookworm. Of the 345 examined 13 were found to have the parasite	1912	0	0	0
	1913	0	0	0
	1914	0	0	0
	1915	144	0	0
	1916	201	0	0
Total, 5 years		345	0	0

[1] Patient admitted for ringworm but died of valvular disease of the heart.

Table 3.—*Admissions by cause, with deaths by primary cause, and case fatality rates for each disease*—Continued.

Cause of admission.	Year.	Number of admissions.	Deaths.	Case fatality.
				Per cent.
"Observation." These include contact cases and cases with ill-defined symptoms of contagious disease who recovered without developing same	1912	30	0	0
	1913	88	[1] 1	0
	1914	77	0	0
	1915	127	0	0
	1916	243	0	0
Total, 5 years		565	[1] 1	0
Accompanying relatives admitted to wards and isolation rooms with small children (includes 1 premature birth)	1912	125	0	0
	1913	156	[2] 1	0
	1914	150	0	0
	1915	103	0	0
	1916	120	0	0
Total, 5 years		654	[2] 1	0

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[1] Patient died from broncho-pneumonia next day after admission without the nature of the acute exanthemeta being determined.

[2] Prematurely born child of a scarlet fever patient who gave birth to the child while in hospital.

In the year 1916 the following diseases were admitted for the first time.[1]

Table 4.—*Diseases admitted for first time in 1916, with number of cases and deaths.*

Cause of admission.	Number of admissions.	Deaths.	Case fatality.
			Per cent.
Leprosy	1	0	0
Scabies	9	0	0
Pediculosis capitis	1	0	0
Chancroid	1	0	0
Syphilis	4	0	0
Impetigo contagioso	2	0	0
Gonorrhoeal urethritis	1	0	0
Purulent conjunctivitis	3	0	0
Gastro-intestinal diseases	3	0	0
Dermatitis exfoliativa	1	0	0
Valvular heart disease	1	1	100
Empyema	1	0	0
Peritonsiliar abscess	1	0	0
Acute catarrhal conjunctivitis	1	0	0
Acute nephritis	1	1	100
Peritonitis (acute), causative factor undetermined	1	1	100
Lupus erythematosus	1	0	0
Raynaud's disease	1	0	0
Supurative otitis media	12	0	0
Hodgkin's disease	1	0	0
Cervical adenitis (simple)	2	0	0
Acne rosacea	1	0	0
Broncho-pneumonia	7	1	14.8
Lobar pneumonia	15	2	13.3
Acute catarrhal laryngitis	1	0	0
Acute catarrhal pharyngitis	10	0	0
Ascaris lumbricoides	2	0	0
Malaria	2	0	0
Furunculosis and subcutaneous abscess formations	2	0	0
Acute follicular tonsillitis	28	0	0
Acute bronchitis	43	0	0
Psoriasis	1	0	0
Icthchyosis	2	0	0
Suspected to be suffering from tuberculosis but found to be free from same	706	0	0
Certified as having tuberculosis	74	7	9.4
Total	943	13	1.37

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[1] With the exception of those admitted to the tuberculosis wards, all the cases in this series were at the time of admission suspected of having been in recent contact with some acute contagious disease.

TABLE 5.—*Total admissions and case fatality, all causes, by years.*

Year.	Number of admissions.	Number of deaths.	Case fatality.
			Per cent.
1912	758	35	4.6
1913	1,316	179	13.6
1914	1,245	97	7.7
1915	681	17	2.4
1916	2,078	48	2.3
Five years	6,078	376	6.1

As this report is primarily intended to deal with the contagious diseases of children and their management in hospital, the foregoing table should be corrected to show the fatality among patients admitted to the hospital solely on account of contagious disease, exposure to same, or suspected exposure to same. This necessitates leaving out of consideration all the patients who were admitted to wards for observation for hookworm, and all those admitted to hospital on account of tuberculosis or suspected tuberculosis. It also requires that accompanying relatives be dropped from the admissions. Such a corrected table follows:

TABLE 6.—*Admissions, deaths, and case fatality for contagious-disease patients.*

Year.	Number of admissions.	Number of deaths.	Case fatality.
			Per cent.
1912	633	35	5.5
1913	1,160	178	15.3
1914	1,095	97	8.8
1915	384	16	4.1
1916	974	39	4.0
Total, five years	4,246	365	8.6

II. ADMISSIONS BY AGE ALL CAUSES, AND DEATHS BY AGE AND PRINCIPAL CAUSE FOR FIVE YEARS.

The following tables give the admissions by age from all causes and the deaths by age and by principal cause:

TABLE 7.—*Admissions by age for five years (all causes), 1912–1916.*

Year.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
1912	60	52	93	90	78	38	52	24	24	16	9	7	5	2	4	79	633
1913	144	103	173	201	129	71	61	49	37	21	13	10	4	3	10	131	1,160
1914	125	95	162	159	144	88	71	45	39	22	16	10	1	4	6	108	1,095
1915	35	48	47	41	43	28	26	16	16	14	10	7	1	2	4	46	384
1916	37	50	127	146	100	72	107	62	53	41	38	34	16	16	17	58	974
Total	401	348	602	637	494	297	317	196	169	114	86	68	27	27	41	422	4,246

TABLE 8.—*Deaths by principal cause and age, 1912.*

Cause.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
Measles	7	10	3	1	2		0	0	0	0	0	1	0	0	0	1	25
Scarlet fever	0	0	1	1	1	2	0	0	0	0	0	0	0	0	0	0	5
Diphtheria	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Cerebrospinal meningitis	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4
Total	8	10	4	2	3	2	1	0	0	0	0	1	0	0	0	4	35

TABLE 9.—*Deaths by principal cause and age, 1913.*

Cause.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
Measles	33	16	28	21	5	4	0	1	1	0	0	0	1	0	0	0	110
Diphtheria	3	1	2	2	0	0	1	0	0	0	0	0	0	0	0	0	9
Cerebrospinal meningitis	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	3	6
Observation	0	0	0	0	0	0	0	0	[1] 1	0	0	0	0	0	0	0	1
German measles	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Scarlet fever	3	7	17	6	7	3	4	1	1	0	0	0	0	0	0	1	50
Whoop cough	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Premature birth	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	41	24	48	29	12	7	5	2	4	1	0	0	1	0	1	4	179

[1] Patient died with broncho-pnenmonia next day after admission; primary diagnosis was not determined.

TABLE 10.—*Deaths by principal cause and age, 1914.*

Cause.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
Measles	23	14	13	8	4	1	0	1	1	0	0	0	0	0	0	1	66
Scarlet fever	2	3	4	3	1	3	0	1	0	1	1	0	0	0	0	3	22
Cerebrospinal fever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	7
Diphtheria	1	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	5
Whooping cough	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	26	18	20	11	5	4	0	3	1	1	1	0	0	0	0	7	101

TABLE 11.—*Deaths by principal cause and age, 1915.*

Cause.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
Measles	1	3	1	5	0	1	1	0	1	0	0	0	0	0	0	0	13
Whooping cough	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Scarlet fever	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Diphtheria	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Organic heart disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[1] 1	1
Total	2	3	2	5	0	1	1	1	1	0	0	0	0	0	0	1	17

[1] This was a patient admitted for ringworm of nails

TABLE 12.—*Deaths by principal cause and age, 1916.*

Cause.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
Measles	1	3	3	3	2	2	1	0	0	0	1	0	0	0	0	0	16
Scarlet fever	1	0	2	4	0	2	1	0	0	0	0	0	0	0	0	0	10
Diphtheria	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
Whooping cough	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	4
Cerebrospinal meningitis	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2
Erysipelas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Peritonitis [1]	0	0	0	0	0	0	0	0	0	0	0	0	[1] 1	0	0	0	1
Nephritis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Lobar pneumonia	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Broncho-pneumonia	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Organic heart disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Pulmonary tubes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7
Total	4	6	8	7	3	5	4	0	0	0	1	0	1	0	0	9	48

[1] General peritonitis of unknown origin.

III. INFLUENCE OF AGE ON INCIDENCE AND PROGNOSIS.

Tables Nos. 7 to 12, inclusive, show all the deaths for the whole five years arranged according to principal cause and age for each year. These give the details grouped by years rather than by diseases. In order to gain an adequate idea of the influence of age on the incidence and prognosis of the contagious diseases of children, it will be necessary to make a general grouping under each particular disease and then add the results for the whole five years. This is done in Tables Nos. 13 to 21, inclusive, where the ages of all cases of measles, scarlet fever, and diphtheria is considered in connection with deaths and recoveries. Cerebrospinal meningitis is analyzed in the same way in Table No. 24. Chicken pox, mumps, German measles, and whooping cough are also analyzed in less detail for the influence of age on pages 26 to 27.

MEASLES.

TABLE 13.—*Admissions for measles.*

Year.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
1912	43	48	72	78	61	28	44	19	24	12	8	6	5	1	2	51	502
1913	114	83	126	148	92	56	43	37	29	14	6	8	2	0	5	71	834
1914	109	79	129	128	121	63	59	31	30	15	10	7	0	3	2	55	841
1915	18	32	27	31	24	12	14	9	8	4	3	1	0	0	0	2	185
1916	7	21	44	57	32	17	24	11	13	1	6	3	2	2	1	11	252
Total	291	263	398	442	330	176	184	107	104	46	33	25	9	6	10	190	2,614

TABLE 14.—*Deaths from measles.*

Year.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
1912	7	10	3	1	2	0	0	0	0	0	0	1	0	0	0	1	25
1913	33	16	28	21	5	4	0	1	1	0	0	0	1	0	0	0	110
1914	23	14	13	8	4	1	0	1	1	0	0	0	0	0	0	1	66
1915	1	3	1	5	0	1	1	0	1	0	0	0	0	0	0	0	13
1916	1	3	3	3	2	2	1	0	0	0	1	0	0	0	0	0	16
Total	65	46	48	38	13	8	2	2	3	0	1	1	1	0	0	2	230
Case fatality, per cent	22	13	12	8	4	4	1	2	3	0	3	4	11	0	0	1	8.7

Of the 291 cases of measles under 1 year of age, 32 were less than 6 months old. Of these 32, 18 were under 5 months of age. The case fatality in this group under 5 months of age was the highest of all being 27.7 per cent. As there are conflicting opinions among different authorities in regard to the gravity of measles in the very young infant, the details of ages and results of this group are interesting as affording evidence that whatever influence tender age may have on the incidence of the disease, it invariably tends to make the prognosis bad.

Table 15.—*Measles patients, 5 months old and under, treated in contagious-disease hospital during five-year period ending July 1, 1916.*

Age.	Month.	Year.	Age.	Month.	Year.
5 months	October	1912	4 months [1]	November	1913
5 months	March	1912	4 months	do	1913
3 months	July	1912	5 months	December	1913
5 months	do	1912	4 months [1]	do	1913
3 months	September	1912	5 months [1]	January	1914
3 months	December	1912	3 months [1]	do	1914
5 months	do	1912	5 months.[1]	do	1914
4 months	January	1913	4 months	April	1914
3 months [1]	March	1913	4 months	do	1914
3 months	do	1913	5 months	May	1914
5 months	May	1913	4 months	do	1914
5 months	do	1913	5 months	August	1914
4 months	June	1913	4 months	October	1914
2 months [1]	do	1913	3 months	May	1915
5 months	October	1913	3 months	June	1915
3 months	November	1913	5 months	April	1916

[1] Died.

Out of 18 patients under 5 months old five died, giving a case fatality for this class of patients of 27.7 per cent.

Out of the total of 32 under 6 months of age seven died, giving a case fatality rate of 21.8 per cent for the whole group under 6 months of age.

A study of these tables shows that the age factor in measles was exceedingly important as bearing upon the prognosis. The first year of life yielded nearly twice as many fatalities as any other year, and in the first six months the danger was especially great. After the third year the danger steadily diminished. The large number of cases occurring in the adult group (over 15 years) is to be accounted for by the greater proportion of arriving aliens in this group, 90 per cent of all immigrants at Ellis Island being over 14 years of age. (See p. 54.)

A study of the details of the tables on pages 44 to 48, where measles is considered as a cross infection in children who are also suffering from some other contagious disease, will show that up to the age of 6 years the prognosis of such cases was extremely bad. Following is a summary of the results of such cross infection in measles for all age groups. The primary infection is that first mentioned in the last column of the table.

	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.	
Cases	2	10	10	10	3	8	4	1	3	1	0	0	1	0	0	0	53	Measles, scarlet fever infection.
Deaths	2	5	3	4	2	2	0	0	0	0	0	0	0	0	0	0	18	
Recoveries	0	5	7	6	1	6	4	1	3	1	0	0	1	0	0	0	35	
Cases	0	5	10	9	10	3	2	2	1	0	0	0	0	0	0	0	42	Measles, whooping cough infection.
Deaths	0	0	3	1	1	0	0	0	1	0	0	0	0	0	0	0	6	
Recoveries	0	5	7	8	9	3	2	2	0	0	0	0	0	0	0	0	36	
Cases	0	0	0	1	1	3	0	0	0	0	0	0	0	0	0	0	5	Measles, mumps infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	0	0	0	1	1	3	0	0	0	0	0	0	0	0	0	0	5	
Cases	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	3	Measles, German measles infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	3	
Cases	0	4	2	2	1	1	0	0	0	0	0	0	0	0	0	0	10	Measles, chicken pox infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	0	4	2	2	1	1	0	0	0	0	0	0	0	0	0	0	10	
Cases	7	7	9	10	8	1	0	0	1	0	0	0	0	0	0	1	44	Measles, diphtheria infection.
Deaths	3	5	6	4	4	1	0	0	0	0	0	0	0	0	0	0	23	
Recoveries	4	2	3	6	4	0	0	0	1	0	0	0	0	0	0	1	21	
Cases	2	4	8	10	10	2	2	1	0	0	1	0	0	0	0	2	42	Scarlet fever, measles infection.
Deaths	0	2	4	4	0	1	0	0	0	0	0	0	0	0	0	0	11	
Recoveries	2	2	4	6	10	1	2	1	0	0	1	0	0	0	0	2	31	
Cases	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Diphtheria, measles infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Cases	1	0	1	1	1	2	0	0	0	0	0	0	0	0	0	0	6	Whooping cough, measles infection.
Deaths	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	
Recoveries	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	4	
Cases	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3	Chicken pox, measles infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3	
Total cases	14	30	41	45	36	20	8	4	5	1	1	0	1	0	0	3	209	
Total deaths	5	12	17	13	7	5	0	0	1	0	0	0	0	0	0	0	60	
Total recoveries	9	18	24	32	29	15	8	4	4	1	1	0	1	0	0	3	149	
Case fatality, per cent	35	40	41	28	19	25	0	0	20	0	0	0	0	0	0	0	......	

SCARLET FEVER.

Although the influence of age upon the prognosis of scarlet fever was marked, it differed from measles in that it was the second rather than the first year of life in which the mortality was highest. More important than age, however, was the severity of the epidemic. The following tabulation, as well as Table 3, on page 10, shows that the case fatality has varied greatly in different years and that in one year (1916) the case fatality for the second year of life was much less than that for all ages for the whole series.

TABLE 17.—*Admissions for scarlet fever.*

Year.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
1912	4	1	8	4	7	5	3	1	2	1	0	0	0	0	1	5	42
1913	6	8	23	30	20	14	7	8	5	2	5	1	1	1	3	28	162
1914	4	2	15	17	15	11	6	7	7	5	3	1	0	0	7	14	114
1915	2	1	2	1	2	3	3	0	0	0	0	1	0	0	1	7	23
1916	2	6	17	28	20	19	26	19	11	11	6	10	3	2	0	9	189
Total	18	18	65	80	64	52	45	35	25	19	14	13	4	3	12	63	530

TABLE 18.—*Deaths from scarlet fever.*

Year.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
1912	0	0	1	1	1	2	0	0	0	0	0	0	0	0	0	0	5
1913	3	7	17	6	7	3	4	1	1	0	0	0	0	0	0	1	50
1914	2	3	4	3	1	3	0	1	0	1	1	0	0	0	0	3	22
1915	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1916	1	0	2	4	0	2	1	0	0	0	0	0	0	0	0	0	10
Total	6	10	25	14	9	10	5	2	1	1	1	0	0	0	0	4	88
Case fatality, per cent	33	55	38	17	14	19	11	5	4	5	7	0	0	0	0	6	16.6

DIPHTHERIA.

By the two following tables it is seen that the highest case fatality occurred during the first and second years of life. Like measles and scarlet fever, the incidence of another infectious disease rendered the chance of recovery many times less than in cases not thus complicated, and here also the prognosis bore a direct relation to the age, as shown in the summary of all cross infections where diphtheria occurred either as a simultaneous, primary, or secondary infection. (See page 25.)

DIPHTHERIA.

Table 20.—*Admissions for diphtheria.*

Year.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years	Over 15 years.	Total.
1912	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	1	5
1913	4	0	5	4	7	0	2	0	0	0	0	0	0	1	0	7	30
1914	1	0	1	1	1	1	2	0	0	1	1	0	0	0	0	0	9
1915	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	3	6
1916	2	1	2	1	1	1	3	2	2	0	0	0	0	0	0	5	20
Total	8	1	9	7	9	3	8	2	3	1	1	0	0	2	0	16	70

Table 21.—*Deaths from diphtheria.*

Year.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.
1912	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
1913	3	1	2	2	0	0	1	0	0	0	0	0	0	0	0	0	9
1914	1	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	5
1915	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1916	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2
Total	5	1	6	2	0	1	2	1	0	0	0	0	0	0	0	0	18
Case fatality, per cent	62	100	66	28	0	33	25	50	0	0	0	0	0	0	0	0	25.7

TABLE 10.—*Recoveries and deaths by age groups of all cross infections in which scarlet fever occurred, either as primary, simultaneous, or secondary infection.*

Ages.	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.	
Cases	2	4	8	10	10	2	2	1	0	0	1	0	0	0	0	2	42	Scarlet fever, measles infection.
Deaths	0	2	4	4	0	1	0	0	0	0	0	0	0	0	0	0	11	
Recoveries	2	2	4	6	10	1	2	1	0	0	1	0	0	0	0	2	31	
Cases	0	0	1	2	3	2	0	1	0	0	1	0	0	0	0	0	10	Simultaneous scarlet fever, diphtheria infection.
Deaths	0	0	1	2	1	1	0	1	0	0	0	0	0	0	0	0	6	
Recoveries	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0	4	
Cases	1	1	0	1	1	2	3	0	0	0	0	0	0	0	0	2	11	Scarlet fever, diphtheria infection.
Deaths	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	
Recoveries	0	1	0	0	1	2	3	0	0	0	0	0	0	0	0	2	9	
Cases	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	4	Scarlet fever, whooping-cough infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	4	
Cases	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	2	Scarlet fever, mumps infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	2	
Cases	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	Scarlet fever, German measles infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	
Cases	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	Scarlet fever, chicken-pox infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	
Cases	1	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	5	Diphtheria, scarlet-fever infection.
Deaths	1	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	4	
Recoveries	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Cases	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	4	Chicken pox, scarlet-fever infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	4	
Cases	2	10	10	10	3	8	4	1	3	1	0	0	1	0	0	0	53	Measles, scarlet-fever infection.
Deaths	2	5	3	4	2	2	0	0	0	0	0	0	0	0	0	0	18	
Recoveries	0	5	7	6	1	6	4	1	3	1	0	0	1	0	0	0	35	
Total cases.	8	15	23	26	20	15	12	4	3	1	1	1	1	0	0	4	134	
Total deaths	4	7	10	11	3	4	0	2	0	0	0	0	0	0	0	0	41	
Total recoveries	4	8	13	15	17	11	12	2	3	1	1	1	1	0	0	4	93	
Case fatality, per cent	50	46	43	42	15	26	0	50	0	0	0	0	0	0	0	0	30	

TABLE 22.—*Recoveries and deaths by age groups of all cross infections in which diphtheria occurred either as primary, simultaneous, or secondary infection.*

	Under 1 year.	1 to 2 years.	2 to 3 years.	3 to 4 years.	4 to 5 years.	5 to 6 years.	6 to 7 years.	7 to 8 years.	8 to 9 years.	9 to 10 years.	10 to 11 years.	11 to 12 years.	12 to 13 years.	13 to 14 years.	14 to 15 years.	Over 15 years.	Total.	
Cases	0	0	1	2	3	2	0	1	0	0	0	1	0	0	0	0	10	Simultaneous, diphtheria, scarlet fever infection.
Deaths	0	0	1	2	1	1	0	1	0	0	0	0	0	0	0	0	6	
Recoveries	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0	0	4	
Cases	1	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	5	Diphtheria, scarlet fever infection.
Deaths	1	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	4	
Recoveries	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Cases	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Diphtheria, measles infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Cases	7	7	9	10	8	1	0	0	1	0	0	0	0	0	0	1	44	Measles, diphtheria infection.
Deaths	3	5	6	4	4	1	0	0	0	0	0	0	0	0	0	0	23	
Recoveries	4	2	3	6	4	0	0	0	1	0	0	0	0	0	0	1	21	
Cases	1	1	0	1	1	2	3	0	0	0	0	0	0	0	0	2	11	Scarlet fever, diphtheria infection.
Deaths	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	
Recoveries	0	1	0	0	1	2	3	0	0	0	0	0	0	0	0	2	9	
Cases	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	German measles, diphtheria infection.
Deaths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Recoveries	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
Cases	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Whooping cough, diphtheria infection.
Deaths	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Recoveries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total cases	10	8	14	13	13	5	3	2	1	0	0	1	0	0	0	3	73	
Total deaths	5	5	10	7	5	2	0	2	0	0	0	0	0	0	0	0	36	
Total recoveries	5	3	4	6	8	3	3	0	1	0	0	1	0	0	0	3	37	
Case fatality, per cent	50	62	71	53	38	40	0	100	0	0	0	0	0	0	0	0	49	

WHOOPING COUGH.

Deaths from whooping cough numbered 7 out of a total of 73 admissions for the whole five-year period. The age distribution was as follows:

TABLE 23.—*Age distribution of whooping-cough cases.*

Between 1 and 2 years	2
Between 2 and 3 years	2
Between 3 and 4 years	0
Between 4 and 5 years	0
Between 5 and 6 years	1
Between 6 and 7 years	0
Between 7 and 8 years	1
Between 8 and 9 years	1
Total deaths	7

The total number of admissions and the deaths was too small to warrant any definite conclusions concerning the influence of age upon prognosis. Experience with the disease leads one to believe that different epidemics vary greatly in severity and that other factors are more potent than age in determining the prognosis. For example, the course of whooping cough is very unfavorably influenced by the onset of another contagious disease. Two of the deaths occurred in children who contracted measles during the course of the whooping cough and one was in a child who developed diphtheria.

A very unfavorable prognosis must be made when whooping cough follows measles. Of 42 cases of this kind 6 died. (See p. 45.) Of these three were 2 years old, one was 3, one was 4, and one was 8. The table on page 45 shows that many recoveries took place in children 2 years old, and that tender age in itself has not apparently been the most potent factor in causing death, even when the whooping cough has immediately followed or been superimposed upon measles.[1]

CHICKEN POX.

There were 79 admissions for this disease. All recovered. Age apparently had no influence upon the course of the disease.

MUMPS.

There were 30 admissions for this disease. All recovered without serious complications. Age apparently had no influence upon the prognosis.

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[1] Among the well-recognized factors in determining the outcome in this disease is sex, it being usually conceded that females show a much higher mortality than males. Of the 7 deaths with the primary cause whooping cough 2 were males and 5 females, but the series is too small to justify any conclusions on this phase of the question.

GERMAN MEASLES.

There were 28 admissions for this disease, with one death in a child 2 years old.

CEREBROSPINAL MENINGITIS.

The following table summarizing the influence of age upon the incidence and prognosis of cerebrospinal meningitis shows both the crude and the corrected case fatality. In the corrected column all those cases in which serum treatment was undertaken late in the course of the disease and those in which death occurred within 24 hours after admission are eliminated. The table thus corrected shows that the greatest mortality occurred before the fifth year and between the sixteenth and twenty-fourth years of life, but the series is too small to warrant definite conclusions as to the influence of ageupon either the incidence or prognosis.

TABLE 24.—*Admissions and deaths on account of epidemic cerebrospinal meningitis by age for five years.*

ADMISSIONS.

	Under 1 year.	1 year.	2 years.	3 years.	4 years.	5 years.	6 years.	7 years.	8 years.	9 years.	10 years.	11 years.	12 years.	13 years.	14 years.	15 years.	16 years.	17 years.	18 years.	19 years.	20 years.	21 years.	22 years.	23 years.	24 to 31 years.	32 years.	32 to 49 years.	50 years.	Total.
1912	1	0	0	1	0	0	0	0	0	0	1	1	0	1	1	0	1	1	2	1	3	0	0	2	0	0	0	0	16
1913	1	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	1	0	0	7
1914	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	2	4	2	2	0	2	1	0	0	0	0	0	1	17
1915	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1916	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Total	2	0	2	3	1	0	1	0	1	1	1	1	0	2	2	2	5	3	6	1	5	1	0	2	0	1	0	1	44

DEATHS.

	Under 1 year.	1 year.	2 years.	3 years.	4 years.	5 years.	6 years.	7 years.	8 years.	9 years.	10 years.	11 years.	12 years.	13 years.	14 years.	15 years.	16 years.	17 years.	18 years.	19 years.	20 years.	21 years.	22 years.	23 years.	24 to 31 years.	32 years.	32 to 49 years.	50 years.	Total.
1912	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	4
1913	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	0	0	0	0	1	0	0	0	0	6
1914	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	3
1915	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1916	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	2	0	0	0	1	0	[1]1	0	0	[1]1	0	0	0	0	[1]1	0	1	0	[2]3	0	[3]2	1	0	2	0	0	0	0	15

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[1] Died within 24 hours after admission.

[2] Two of these cases had been ill several days before admission and had received no treatment.

Both of these cases had been ill several days before admission and had received no treatment.

IV. INFLUENCE OF SEASON UPON INCIDENCE AND PROGNOSIS OF MEASLES, SCARLET FEVER, DIPHTHERIA, CEREBROSPINAL MENINGITIS, AND WHOOPING COUGH.

Although the winter season had some slight tendency to increase the admissions from these diseases owing to more intimate contact in detention rooms and in the steerage, it played a much less important part than in the ordinary community. Other factors more important than season determined the incidence of the diseases. These were: First, the amount of immigration; second, the sanitary condition of the steerage; third, the length of time the immigrants were detained in the administration building before being landed; and fourth, in the case of measles, some unknown factor which determined the periodicity of epidemics. All these must be considered in the interpretation of the following tables showing the incidence of these diseases by months for a period of five years. However, when it comes to a consideration of the influence of season upon the incidence of the complications and the case fatality of the several diseases, the tables may be interpreted with small allowance for other factors.

MEASLES.

TABLE 25.—*Measles admissions by months for five years compared with deaths by months for the same period.*

	Admissions.						Deaths.						
	1912	1913	1914	1915	1916	Total.	1912	1913	1914	1915	1916	Total.	Case fatality. *Per cent.*
July	16	49	135	43	9	252	0	1	8	2	0	11	4
August	15	24	46	6	3	94	0	1	8	1	0	10	10
September	28	15	57	4	0	104	0	1	6	0	0	7	6
October	29	34	80	7	2	152	0	0	5	1	0	6	3
November	64	52	96	5	7	224	3	4	4	3	0	14	6
December	41	113	195	4	59	412	3	17	10	1	2	33	8
January	21	67	27	9	28	152	4	15	14	0	6	39	25
February	48	24	33	27	26	158	0	8	3	1	1	13	8
March	30	82	23	9	29	173	3	9	3	2	4	21	12
April	61	126	36	25	13	261	3	20	2	1	0	26	9
May	99	132	69	31	49	380	6	26	1	0	1	34	8
June	50	116	44	15	27	252	3	8	2	1	2	16	6
Total	502	834	841	185	252	2,614	25	110	66	13	16	230	8.7

TABLE 26.—*Incidence of measles complicated with broncho-pneumonia by months for five years compared with deaths from measles complicated with broncho-pneumonia for the same period.*

INCIDENCE OF BRONCHO-PNEUMONIA.

Month.	1912	1913	1914	1915	1916	Total.	Percentage with broncho-pneumonia.
July	0	3	9	3	1	16	6
August	0	2	8	3	0	13	13
September	1	4	6	0	0	11	10
October	4	1	7	1	0	13	8
November	3	3	8	1	0	15	6
December	6	17	15	1	2	41	9
January	3	15	12	0	8	38	25
February	1	8	5	1	0	15	9
March	5	7	3	3	5	23	13
April	5	13	5	1	4	28	10
May	9	21	5	1	3	39	10
June	5	12	6	3	0	26	10
Total	42	106	89	18	23	278	10
Percentage with broncho-pneumonia	8	12	10	9	9	10	....

TABLE 26.—*Incidence of measles complicated with broncho-pneumonia by months for five years compared with deaths from measles complicated with broncho-pneumonia for the same period*—Continued.

DEATHS COMPLICATED WITH BRONCHO-PNEUMONIA.

Month.	1912	1913	1914	1915	1916	Total.	Case fatality from broncho-pneumonia.
							Per cent.
July	0	1	6	1	0	8	50
August	0	1	4	1	0	6	46
September	0	0	2	0	0	2	18
October	0	0	3	1	0	4	30
November	2	3	3	1	0	9	60
December	3	15	5	1	1	25	60
January	2	9	6	0	2	19	50
February	0	4	4	1	0	9	60
March	2	5	3	1	1	12	52
April	3	9	1	1	0	14	50
May	6	21	1	0	0	28	71
June	2	4	1	0	1	8	30
Total	20	72	39	8	5	144	51
Case fatality, per cent	47	67	43	44	21	52	....

The foregoing tables may be rendered clearer by reference to the accompanying chart. There it will be seen that with the exception of January no one month has shown any great departure from the average of 10 per cent in the incidence of broncho-pneumonia as a complication of measles. January is also the only month which has shown any marked rise from the average case fatality of 8.7 per cent. The influence of season upon the case fatality of measles complicated by broncho-pneumonia has apparently been nil. The curves of the

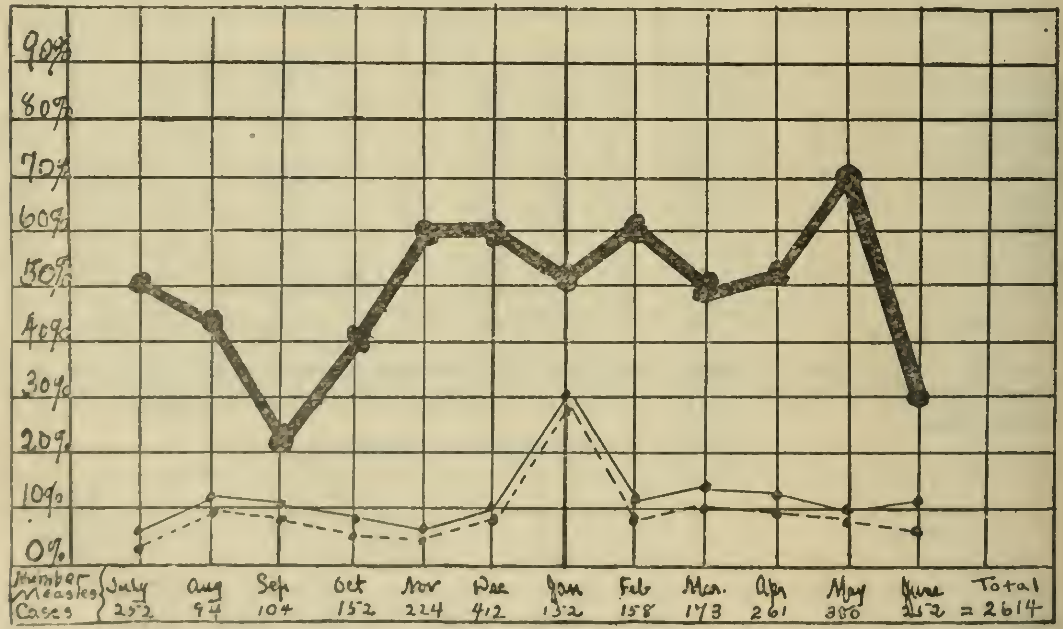

CHART NO. 1.—Influence of season upon the incidence of bronchopneumonia and the case fatality of measles. Upper heavy line, case fatality of bronchopneumonia complicating measles; lower solid line, incidence rate of bronchopneumonia complicating measles; dotted line, case fatality all cases of measles.)

incidence of this complication and the case fatality therefrom often diverge widely and manifest no general tendency to follow each other. The practical identity of the incidence of broncho-pneumonia and the general case fatality from measles is striking and will be referred to again when this disease is discussed in detail. (See p. 57.)

SCARLET FEVER.

TABLE 27.—*Scarlet fever admissions by months for five years compared with deaths by months for same period.*

ADMISSIONS.

Month.	1912	1913	1914	1915	1916	Total.
July	3	2	5	1	0	11
August	1	7	9	3	1	21
September	3	5	3	1	4	16
October	1	16	11	0	30	58
November	3	7	10	0	12	32
December	14	18	13	0	50	95
January	1	13	13	5	44	76
February	0	13	7	2	17	39
March	2	12	15	2	12	43
April	7	26	16	2	9	60
May	4	25	10	4	7	50
June	3	16	2	3	3	27
Total	42	160	114	23	189	528
Case fatality by years, per cent	11.9	31	19.2	3	5.2	16.6

DEATHS.

Month.	1912	1913	1914	1915	1916	Total.	Case fatality.
							Per cent.
July	0	2	2	1	1	6	54
August	0	1	2	0	0	3	13
September	0	1	0	0	0	1	6
October	0	1	1	0	0	2	3
November	1	1	2	0	0	4	12
December	0	3	2	0	2	7	7
January	1	6	2	0	1	10	13
February	1	3	4	0	4	12	30
March	0	2	2	0	1	5	11
April	1	9	0	0	1	11	18
May	1	14	4	0	0	19	38
June	0	7	1	0	0	8	29
Total	5	50	22	1	10	88	16.6

Analysis of the foregoing table shows that season has had an appreciable influence upon the incidence of scarlet fever, over half the cases having occurred between the late fall and early summer. The wide variations in the case fatality apparently depended entirely upon the severity of the initial infection and the occurrence of cross infections, which are considered in table No. 43.

DIPHTHERIA.

TABLE 28.—*Diphtheria admissions, by months, for 5 years compared with deaths by months for the same period.*

ADMISSIONS.

Month.	1912	1913	1914	1915	1916	Total.
July	0	6	0	0	4	10
August	0	0	0	1	1	2
September	0	2	1	0	2	5
October	0	3	0	0	0	3
November	1	4	3	1	1	10
December	0	5	2	2	1	10
January	0	0	0	0	1	1
February	1	1	0	0	3	5
March	1	1	1	0	4	7
April	0	4	1	0	0	5
May	0	1	1	0	1	3
June	2	3	0	2	2	9
Total	5	30	9	6	20	70
Case fatality by years, per cent	20	30	55	16	10	25.7

DEATHS.

Month.	1912	1913	1914	1915	1916	Total.	Case fatal.
							Per cent.
July	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0
October	0	1	2	0	0	3	100
November	0	1	0	1	1	3	30
December	0	3	0	0	0	3	30
January	0	0	0	0	0	0	0
February	0	1	0	0	1	2	40
March	0	0	1	0	0	1	14
April	0	2	1	0	0	3	60
May	0	1	0	0	0	1	33
June	1	0	1	0	0	2	22
Total	1	9	5	1	2	18	25.7

Careful study of the cases as summarized in the foregoing table showed only two periods in which diphtheria admissions greatly exceeded those for the rest of the year. These were the early winter and early summer months.

Besides the 70 admissions for diphtheria, there were 68 for other diseases in which diphtheria was either a complicating factor at the time of admission or subsequently became such.. So far as months were concerned, the general distribution of these 68 secondary cases followed closely that of the primary cases.

The case fatality was less in summer than in winter. It is difficult to determine just how much, if any, of this difference was due to seasonal influence and how much was dependent upon other factors. It would appear, however, that at least a part of it could be reasonably attributed to factors directly or indirectly connected with cold weather. Both exposure to inclement weather prior to admission to hospital and overcrowding in detention rooms and on board ship when already debilitated from the toxines of the disease occurred more frequently in the winter than in the summer.

Besides the 18 deaths occurring in patients with a primary diagnosis of diphtheria, there were 33 deaths in which it was a contributory cause. If we group the total 51 deaths according to the months in which they occurred for the whole five-year period we have the following distribution:

TABLE 29.—*Monthly distribution of deaths from diphtheria for years 1912–1916.*

Month.	Number of cases.	Percentage.	Month.	Number of cases.	Percentage.
July	3	6	January	8	14
August	2	4	February	7	14
September	1	2	March	9	18
October	3	6	April	3	6
November	4	8	May	3	6
December	5	10	June	3	6

From a study of these 138 cases of diphtheria (70 primary and 68 secondary) it appears that, although the disease was only slightly more prevalent in fall and winter than in summer, the case fatality was decidedly higher in the colder months.

EPIDEMIC CEREBROSPINAL MENINGITIS.

TABLE 30.—*Admissions and deaths from epidemic cerebrospinal meningitis by months for five years.*

ADMISSIONS.

Month.	1912	1913	1914	1915	1916	Total.
uly	1	0	0	0	0	1
August	1	1	0	0	0	2
September	0	1	0	0	0	1
October	0	1	0	0	0	1
November	0	0	0	0	0	0
December	0	1	0	0	0	1
anuary	0	0	1	0	0	1
February	0	0	1	0	1	2
March	9	0	2	0	3	14
April	5	3	3	0	0	11
May	0	3	1	0	0	4
une	0	1	5	0	0	6
Total	16	11	13	0	4	44

DEATHS.

Month.	1912	1913	1914	1915	1916	Total.	Case fatal.
							Per cent.
uly	1	0	0	0	0	1	100
August	0	1	0	0	0	1	50
September	0	0	0	0	0	0	0
October	0	1	0	0	0	1	100
November	0	0	0	0	0	0	0
December	0	0	0	0	0	0	0
anuary	0	0	0	0	0	0	0
February	0	0	0	0	1	1	50
March	3	0	0	0	1	4	28
April	1	3	1	0	0	5	45
May	0	1	0	0	0	1	25
une	0	1	0	0	0	1	16
Total	5	7	1	0	2	15	....

The influence of season on the incidence of epidemic cerebrospinal meningitis was very marked, 79.5 per cent of all cases having been admitted during the spring and early summer. The case fatality was apparently uninfluenced by season.

WHOOPING COUGH.

TABLE 31.—*Admissions and deaths from whooping cough by months for five years.*

ADMISSIONS.

Month.	1912	1913	1914	1915	1916	Total.
July	1	3	0	1	1	6
August	0	4	2	0	0	6
September	0	1	0	0	3	4
October	0	2	1	1	3	7
November	0	0	0	0	2	2
December	0	2	1	2	2	7
January	0	1	1	0	1	3
February	0	1	0	2	2	5
March	0	0	1	1	4	6
April	0	0	1	0	0	1
May	2	1	1	3	9	16
June	5	0	0	3	2	10
Total	8	15	8	13	29	73
Case fatality by years, per cent	0	6.6	12.5	7.6	13.7	9.5

DEATHS.

Month.	1912	1913	1914	1915	1916	Total.	Case fatality.
							Per cent.
July	0	0	0	1	0	1	16
August	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0
November	0	0	1	0	1	2	100
December	0	0	0	0	1	1	14
January	0	1	0	0	0	1	33
February	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0
April	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0
June	0	0	0	0	2	2	20
Total	0	1	1	1	4	7	9.5

Analysis of admissions and deaths on account of whooping cough shows that more cases occurred in May and June than in any other seasons of the year. The influence of season upon the case fatality was not apparent.

V. INFLUENCE OF COMPLICATIONS AND CROSS INFECTIONS UPON PROGNOSIS.

DEATHS BY MONTHS, PRINCIPAL CAUSES, AND COMPLICATIONS.

It is generally held that uncomplicated cases of contagious disease in children rarely terminate fatally. In our series this was found to be true of some of the infections, but not of others. Scarlet fever often produced death without any intervening complication, whereas this happened but seldom in measles. Uncomplicated cases of diphtheria usually recovered; those who had another infectious disease complicating the diphtheria seldom recovered.

The exact influence of the various complications and cross infections upon prognosis can be best appreciated by studying all deaths which occurred with reference to these factors. The following tables show deaths by months for the whole five years arranged so as to indicate both the primary and principal contributory cause.

TABLE 32.—*Deaths by months, principal causes and complications, year ending July 1, 1912.*

	Measles.					Scarlet fever.				Cerebrospinal fever.			Diphtheria.		
	Uncomplicated.	Broncho-pneumonia.	Diarrheal diseases.	Diphtheria.	Total.	Uncomplicated.	Broncho-pneumonia.	Measles.	Total.	Uncomplicated.	Diarrheal diseases.	Total.	Uncomplicated.	Total.	Grand total.
July	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
November	0	2	1	0	3	1	0	0	1	0	0	0	0	0	4
December	0	3	0	0	3	0	0	0	0	0	0	0	0	0	3
January	0	2	2	0	4	0	1	0	1	0	0	0	0	0	5
February	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1
March	0	2	0	1	3	0	0	0	0	2	0	2	0	0	5
April	0	3	0	0	3	0	0	1	1	0	1	1	0	0	5
May	0	6	0	0	6	1	0	0	1	1	0	1	0	0	8
June	0	2	1	0	3	0	0	0	0	0	0	0	1	1	4
Total	0	20	4	1	25	2	1	2	5	3	1	4	1	1	35

TABLE 33.—*Deaths by months, principal causes and complications, year ending July 1, 1913.*

	Measles.										Scarlet fever.								Cerebrospinal fever.				Diphtheria.					Whooping cough.			Premature birth, uncomplicated.	Observation.	German measles.			Grand total.
	Uncomplicated.	Suppurative inflammation lymphatis glands.	Whooping cough.	Otitis media.	Diphtheria.	Scarlet fever.	Broncho-pneumonia.	Diarrheal diseases.	Other complications.	Total.	Uncomplicated.	Suppurative inflammation lymphatic glands.	Premature labor.	Measles.	Diarrheal diseases.	Diphtheria.	Broncho-pneumonia.	Total.	Uncomplicated.	Diarrheal diseases.	Pyemia.	Total.	Uncomplicated.	Broncho-pneumonia.	Scarlet fever.	Nephritis.	Total.	Uncomplicated.	Broncho-pneumonia.	Total.			Uncomplicated.	Broncho-pneumonia.	Total.	
July	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4
August	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
September	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
October	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	3
November	0	0	0	0	0	0	3	1	0	4	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	6
December	0	0	0	0	0	0	15	0	2	17	0	2	0	0	0	1	0	3	0	0	0	0	1	0	2	0	3	0	0	0	0	0	0	0	0	23
January	0	0	0	0	1	0	9	4	1	15	0	2	0	0	0	1	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	22
February	0	0	0	0	0	2	4	2	0	8	1	1	0	0	0	1	0	3	0	0	0	0	1	0	0	0	1	0	1	1	1	0	0	0	0	14
March	0	0	0	0	0	2	5	1	1	9	1	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
April	1	0	3	1	0	3	9	0	3	20	7	0	0	2	0	0	0	9	1	0	0	1	2	0	0	0	2	0	0	0	0	0	0	0	0	32
May	0	1	1	0	0	1	21	1	1	26	8	0	0	2	0	1	3	14	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	42
June	0	0	1	1	0	0	4	1	1	8	4	0	0	2	0	0	1	7	1	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	18
Total	1	1	5	2	1	8	72	10	10	110	22	7	1	6	1	6	7	50	4	0	2	6	4	1	3	1	9	0	1	1	1	[1] 1	0	1	1	179

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[1] Patient died from broncho-pneumonia next day after admission without the nature of the actute exanthemata being determined.

TABLE 34.—*Deaths by months, principal causes and complications, year ending July 1, 1914.*

	Measles.									Scarlet fever.							Cerebrospinal fever.			Diphtheria.					Pertussis.			
	Uncomplicated.	Whooping cough.	Broncho-pneumonia.	Diarrheal diseases.	Scarlet fever.	Diphtheria.	Otitis media.	Nephritis.	Total.	Uncomplicated.	Measles.	Suppurative inflammation glands, neck.	Meningitis.	Lobar pneumonia.	Diphtheria.	Total.	Uncomplicated.	Otitis media.	Total.	Uncomplicated.	Abcess of neck.	Broncho-pneumonia.	Scralet fever.	Total.	Uncomplicated.	Diarrheal diseases.	Total.	Grand total.
July	0	0	6	0	0	2	0	0	8	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	10
August	1	0	4	0	0	2	1	0	8	2	0	0	0	0	0	2	1	0	1	0	0	0	0	0	0	0	0	11
September	0	0	2	3	0	1	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
October	0	0	3	1	1	0	0	0	5	1	0	0	0	0	0	1	0	0	0	1	1	0	0	2	0	0	0	8
November	0	0	3	1	0	0	0	0	4	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	1	7
December	0	0	5	2	0	1	2	0	10	1	0	0	0	1	0	2	0	1	1	0	0	0	0	0	0	0	0	13
January	0	1	7	1	1	2	2	0	14	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	16
February	0	0	3	0	0	0	0	0	3	3	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	7
March	0	0	0	0	2	1	0	0	3	0	0	0	1	0	1	2	0	0	0	1	0	0	0	1	0	0	0	6
April	0	0	1	0	1	0	0	0	2	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0	4
May	0	0	1	0	0	0	0	0	1	3	1	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	5
June	0	0	1	0	0	0	0	1	2	1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	4
Total	1	1	36	8	5	9	5	1	66	16	1	1	1	1	2	22	2	1	3	2	1	1	1	5	0	1	1	97

TABLE 35.—*Deaths by months, principal causes and complications, year ending July 1, 1915.*

	Measles.						Scarlet fever.			Pertussis.			Diphtheria, uncomplicated.	Ringworm of nails.			Grand total.
	Uncomplicated.	Bronchopneumonia.	Otitis media.	Diphtheria.	Meningitis.	Total.	Uncomplicated.	Bronchopneumonia.	Total.	Uncomplicated.	Bronchopneumonia.	Total.		Uncomplicated.	Organic heart disease.	Total.	
July	0	1	1	0	0	2	0	1	1	0	1	1	0	0	0	0	4
August	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
September	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
October	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
November	1	1	0	0	1	3	0	0	0	0	0	0	1	0	0	0	4
December	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
January	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
February	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
March	0	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	2
April	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	2	8	1	1	1	13	0	1	1	0	1	1	1	0	1	1	17

TABLE 36.—*Deaths by months, principal causes and complications, year ending July 1, 1916.*

	Measles.								Scarlet fever.							Diphtheria, uncomplicated.	Cerebrospinal fever, uncomplicated.	Whooping cough.				Nephritis.			Erysipelas.			Peritonitis.	Broncho-pneumonia, uncomplicated.	Lobar pneumonia, uncomplicated.	Valvular heart disease, uncomplicated.	Pulmonary tuberculosis, uncomplicated.	Grand total.
	Uncomplicated.	Meningitis.	Broncho-pneumonia.	Scarlet fever.	Otitis media.	Diphtheria.	Bronchitis.	Total.	Uncomplicated.	Diphtheria.	Broncho-pneumonia.	Measles.	Otitis media.	Nephritis.	Total.			Uncomplicated.	Broncho-pneumonia.	Measles.	Total.	Uncomplicated.	Laryngitic diphtheria.	Total.	Uncomplicated.	Lobar pneumonia.	Total.						
July	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
August	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
September	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
November	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
December	1	0	1	0	0	0	0	2	0	0	2	0	0	0	2	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	5
January	0	0	2	3	1	0	0	6	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
February	0	0	0	0	1	0	0	1	0	1	0	1	1	1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
March	0	0	1	1	0	1	1	4	0	0	0	0	0	1	1	0	2	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	10
April	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3	7
May	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	4
June	0	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	1	5
Total	1	1	5	5	2	1	1	16	2	1	2	2	1	2	10	2	2	0	2	2	4	0	1	1	0	1	1	[1]1	1	2	1	7	48

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[1] Patient died from an acute general peritonitis, the exact cause of which was never determined.

DEATHS BY YEARS WITH PRINCIPAL COMPLICATIONS.

Summarizing the foregoing tables so as to show the significance of the complications as they occurred in the different diseases, we have the following results:

TABLE 37.—*Principal complications in deaths from measles for five years.*

	1912	1913	1914	1915	1916	Total.
Uncomplicated	0	1	1	2	1	5
Complications:						
Broncho-pneumonia	20	72	36	8	5	141
Gastrointestinal complications	4	10	8	0	0	22
Diphtheria	1	11	9	1	1	23
Whooping cough	0	5	1	0	0	6
Scarlet fever	0	8	5	0	5	18
Suppurative otitis media	0	2	5	1	2	10
Inflammation of lymphatic glands	0	1	0	0	0	1
Nephritis	0	0	1	0	0	1
Bronchitis	0	0	0	0	1	1
Meningitis	0	0	0	1	1	2
Total	25	110	66	13	16	230

It will be seen that broncho-pneumonia was classed as the principal complication in over 60 per cent of the fatal cases. Although very serious, it should by no means be regarded as necessarily fatal. References to charts Nos. 1 and 9 will show that, although the fatality from this complication averaged over 50 per cent, it was subject to extreme fluctuations and the severity of measles epidemics was determined by the incidence of broncho-pneumonia rather than by the deaths thus complicated.

The significance of measles complicated by diphtheria and scarlet fever can best be appreciated by studying table No. 43, page — et seq., where the incidence and case fatalities of the cross infections are considered in detail.

Although otitis media is mentioned as the principal complication in 10 fatalities, it is doubtful whether it was in many instances a contributory factor of much importance. It often occurred in severe cases which died from a profound general toxemia, and in such instances was considered as one of the indirect manifestations of this toxemia rather than a direct cause of death. There were 29 mastoid operations upon measles patients. Although four of these died there was only one in which the ear trouble or the operation was a contributory cause of death.

The exact significance of the chief complications in fatal cases can be best appreciated when considered in relation to their frequency in nonfatal cases. Thus out of 2,614 measles admissions for the five years—

Broncho-pneumonia occurred 278 times with 141 deaths, giving a case fatality of 50 per cent.

Diphtheria occurred 44 times with 23 deaths, giving a case fatality of 52 per cent.

Scarlet fever occurred 53 times with 18 deaths, giving a case fatality of 34 per cent.

Whooping cough occurred 42 times with 6 deaths, giving a case fatality of 14 per cent.

Gastrointestinal complications occurred 92 times with 22 deaths, giving a case fatality of 24 per cent.

Suppurative otitis media occurred 481 times with 10 deaths, giving a case fatality of 2 per cent.

Nephritis occurred 18 times with 1 death, giving a case fatality of 5 per cent.

Inflammation of lymphatic glands occurred 17 times with 1 death, giving a case fatality of 6 per cent.

Bronchitis (not including the symptomatic bronchitis of measles) occurred 15 times with 1 death, giving a case fatality of 7 per cent.

Meningitis occurred 2 times with 2 deaths, giving a case fatality of 100 per cent.

Uncomplicated cases occurred 1,700 times with 5 deaths, giving a case fatality of 0.3 per cent.[1]

TABLE 38.—*Principal complications in deaths from scarlet fever for five years.*

	1912	1913	1914	1915	1916	Total.
Uncomplicated	2	22	16	0	2	42
Complications:						
Broncho-pneumonia	1	7	0	1	2	11
Suppurative inflammation of lymphatic glands of neck	0	7	1	0	0	8
Gastrointestinal complications	0	1	0	0	0	1
Premature labor	0	1	0	0	0	1
Lobar pneumonia	0	0	1	0	0	1
Nephritis	0	0	0	0	2	2
Suppurative otitis media	0	0	0	0	1	1
Meningitis	0	0	1	0	0	1
Measles	2	6	1	0	2	11
Diphtheria	0	6	2	0	1	9
Total	5	50	22	1	10	88

The deaths noted in Table 38 occurred among 530 cases of scarlet fever treated in the five years. It will be seen that unlike measles the uncomplicated cases formed the largest single group of deaths. Nearly half the deaths occurred during the first week of the disease and were apparently caused by the overwhelming toxemia incident to the primary infection. The most important complications, with the resulting case fatality, were as follows:

Broncho-pneumonia occurred 27 times with 11 deaths, giving a case fatality of 40 per cent.

Measles occurred 42 times with 11 deaths, giving a case fatality of 26 per cent.

---

[1] Uncomplicated deaths from measles occurred in certain very young children where the death seemed to be due to a profound toxemia rather than to any distinct complication.

Diphtheria occurred 21 times with 9 deaths, giving a case fatality of 43 per cent.

Nephritis occurred 38 times with two deaths, giving a case fatality of 5 per cent.

Suppurative otitis media occurred 100 times with 1 death, giving a case fatality of 1 per cent.

Parotid abscess occurred 2 times with no deaths.

There were 7 single and 1 double mastoid operations with no deaths.

From the foregoing it is evident that the chief danger was connected, first, with the virulence of the infection, which either suddenly overwhelmed the patient by its first onslaught; or, failing in this, so weakened him that a terminal broncho-pneumonia proved a fatal ally; or, second, with the incidence of a cross-infection.

TABLE 39.—*Principal complications in deaths from diphtheria for five years.*

	1912	1913	1914	1915	1916	Total.
Uncomplicated	1	4	2	1	2	10
Complications:						
Broncho-pneumonia	0	1	1	0	0	2
Scarlet fever	0	3	1	0	0	4
Nephritis	0	1	0	0	0	1
Suppurative inflammation of glands of neck	0	0	1	0	0	1
Total	1	9	5	1	2	18

The 18 deaths noted above occurred among 70 patients in whom the primary diagnosis was diphtheria. By uncomplicated cases are meant those in whom the profound toxemia was the only ascertainable cause of death.

TABLE 40.—*Principal complications in deaths from whooping cough for five years.*

	1912	1913	1914	1915	1916	Total.
Uncomplicated	0	0	0	0	0	0
Complications:						
Broncho-pneumonia	0	1	0	1	2	4
Gastro-intestinal complications	0	0	1	0	0	1
Measles	0	0	0	0	2	2
Total	0	1	1	1	4	7

In all of the deaths from whooping cough there was some superimposed complication which was the determining factor. The toxines of this disease were apparently unable to produce a fatal result unless aided by some other deleterious influence. The 7 deaths noted in Table 37 occurred in 73 patients in whom the primary diagnosis was whooping cough. Besides these there were 42 cases following measles and 4 cases following scarlet fever. Among these 46 secondary cases there were 6 deaths, all of which occurred in the cases secondary to measles.

If, to the 6 deaths from whooping cough following measles, we add the 2 deaths attributed to measles following whooping cough, we have 8 resulting from a combination of the two diseases. From this it appears that the combination of measles and whooping cough was an extremely grave one, having occurred 8 times out of a total of 13 deaths. Moreover the case fatality of whooping cough uncomplicated with measles was 7.5 per cent as contrasted with 16.6 per cent in cases thus complicated. In other words, the occurrence of measles either immediately before or during an attack of whooping cough more than doubled the danger of death from the latter disease.

TABLE 41.—*Principal complications in epidemic cerebrospinal meningitis for 5 years.*

	1912	1913	1914	1915	1916	Total.
Uncomplicated	3	4	2	0	2	11
Complications:						
Gastrointestinal complications	1	0	0	0	0	1
Pyemia	0	2	0	0	0	2
Suppurative otitis media	0	0	1	0	1	2
Total	4	6	3	0	3	16

From the foregoing table it will be seen that the influence of complications was not an important factor in determining the mortality of cerebro-spinal meningitis.

VI. STATISTICAL DETAILS OF ALL CASES OF CROSS INFECTION FOR FIVE YEARS.

Although the influence of cross infection on mortality has already been alluded to in some detail, the significance of this complication can be better understood if all such cases be studied together. It is desirable not only to know the influence of cross infection on the prognosis, but also to determine, if possible, just how much of the cross infection was preventable.

The question as to whether the secondary infection occurred before or after the patient was admitted to the hospital was in many instances impossible of exact determination. In order to arrive at a fair opinion, doubtful cases were put into a separate class. The following table will show when infections from the different diseases were considered as having occurred before or after admittance:

TABLE 42.—*Showing during what periods after admission secondary infections were regarded as having occurred before or after admission or were regarded as doubtful.*

Disease.	Infection regarded as being contracted before admission.	Doubtful.	Infection regarded as being contracted in hospital.
Measles[1]	1 to 8 days	9 to 18 days	19 days and above.
Diphtheria[2]	1 to 2 days	3 to 5 days	6 days and above.
Scarlet fever[3]	1 to 2 days	3 to 8 days	9 days and above.
Chicken pox	1 to 13 days	14 to 16 days	17 days and above.
Mumps	1 to 16 days	17 to 21 days	22 days and above.
Whooping cough[4]	1 to 15 days		16 days and above.
German measles	1 to 10 days	10 to 20 days	21 days and above.

---

[1] Onset dated from appearance of catarrhal symptoms.

[2] There were diagnosed as diphtheria only those cases which were both clinically and bacteriologically such.

[3] Onset dated from first appearance of rash.

[4] Onset dated from first characteristic whoop.

Tables are appended which show the age of the patient developing the cross infection, the nature of the infection, the time in which the infection developed, and the final outcome to the patient.

TABLE 43.—*Cross infections for five years ending July 1, 1916.*

Disease for which admitted.	Secondary infectious disease developed in hospital.	Age of patient.		Number of days between admission and second infection.	When exposed to second infection.			Result.		Death rate per 100 cases.
					Before admission.	After admission.	Doubtful.	Recovered.	Died.	
		Yr.	*mo.*							
Measles...........	Diphtheria.........	8	0	5	....	....	1	1	....	....
		4	0	0	1	....	....	....	1	....
		4	0	0	1	....	....	1	....	....
		4	0	1	1	....	....	1	....	....
		4	0	6	....	1	....	....	1	....
		2	0	10	....	1	....	....	1	....
		4	0	0	1	....	....	....	1	....
		3	0	3	....	....	1	....	1	....
		2	0	14	....	1	....	....	1	....
		3	0	1	1	....	....	....	1	....
		1	6	4	....	....	1	....	1	....
		1	5	1	1	....	....	....	1	....
		2	0	10	....	1	....	....	1	....
		2	6	0	1	....	....	....	1	....
		2	0	11	....	1	....	....	1	....
			10	0	1	....	....	....	1	....
			11	0	1	....	....	....	1	....
		17	0	8	....	1	....	1	....	....
		3	0	1	1	....	....	1	....	....
			9	60	....	1	....	1	....	....
			11	22	....	1	....	1	....	....
		3	0	18	....	1	....	1	....	....
		2	0	1	1	....	....	....	1	....
		1	6	3	....	....	1	....	1	....
		5	0	2	1	....	....	....	1	....
		1	4	41	....	1	....	....	1	....
			11	1	1	....	....	1	....	....
		2	0	12	....	1	....	1	....	....
			11	12	....	1	....	....	1	....
		3	0	6	....	1	....	....	1	....
		2	0	11	....	1	....	1	....	....
		2	0	4	....	....	1	1	....	....
		3	0	0	1	....	....	1	....	....
			11	4	....	....	1	1	....	....
		4	0	3	....	....	1	1	....	....
		3	0	4	....	....	1	....	1	....
		3	0	0	1	....	....	1	....	....
		1	6	1	1	....	....	1	....	....
		1	6	2	1	....	....	1	....	....
		1	0	33	....	1	....	....	1	....
		4	0	2	1	....	....	1	....	....
		3	0	14	....	1	....	1	....	....
		4	0	0	1	....	....	....	1	....
		3	0	0	1	....	....	1	....	....
Total......	....	....		....	20	16	8	21	23	52
Measles...........	....		10	5	....	....	1	....	1	....
		2	0	5	....	....	1	....	1	....
		3	6	13	....	1	....	....	1	....
		3	0	23	....	1	....	....	1	....
		2	0	9	....	1	....	....	1	....
		3	0	13	....	1	....	....	1	....
			11	19	....	1	....	....	1	....
		3	0	21	....	1	....	1	....	....
		9	0	5	....	....	1	1	....	....
		3	0	10	....	1	....	1	....	....
		3	6	0	1	....	....	1	....	....
		4	6	60	....	1	....	1	....	....
		2	0	10	....	1	....	1	....	....
		4	6	0	1	....	....	....	1	....
		6	0	3	....	....	1	1	....	....
		2	7	1	1	....	....	....	1	....
		1	4	1	1	....	....	....	1	....

TABLE 43.—*Cross infections for five years ending July 1, 1916*—Continued.

Disease for which admitted.	Secondary infectious disease developed in hospital.	Age of patient.	Number of days between admission and second infection.	When exposed to second infection.			Result.		Death rate per 100 cases.
				Before admission.	After admission.	Doubtful.	Recovered.	Died.	
		Yr. mo.							
Measles...........	Scarlet fever......	2 0	1	1	....	....	....	1	....
		5 0	20	....	1	....	1	....	....
		8 0	26	....	1	....	1	....	....
		5 0	22	....	1	....	1	....	....
		5 0	16	....	1	....	1	....	....
		1 2	7	....	....	1	1	....	....
		1 8	4	....	....	1	....	1	....
		5 0	12	....	1	....	1	....	....
		7 0	14	....	1	....	1	....	....
		2 0	40	....	1	....	1	....	....
		1 0	9	....	1	....	....	1	....
		2 6	14	....	1	....	1	....	....
		2 0	2	1	....	....	1	....	....
		4 0	0	1	....	....	1	....	....
		1 4	0	1	....	....	1	....	....
		3 0	12	....	1	....	1	....	....
		1 6	0	1	....	....	1	....	....
		8 0	0	1	....	....	1	....	....
		1 6	0	1	....	....	1	....	....
		6 0	0	1	....	....	1	....	....
		12 0	0	1	....	....	1	....	....
		3 0	7	1	....	....	1	....	....
		1 1	7	1	....	....	....	1	....
		3 0	4	1	....	....	....	1	....
		2 0	0	1	....	....	1	....	....
		6 0	0	1	....	....	1	....	....
		2 0	6	1	....	....	1	....	....
		4 0	0	1	....	....	....	1	....
		5 0	0	1	....	....	1	....	....
		8 0	4	1	....	....	1	....	....
		5 0	0	1	....	....	1	....	....
		5 0	6	1	....	....	....	1	....
		3 0	9	....	1	....	1	....	....
		6 0	0	1	....	....	1	....	....
		5 0	0	1	....	....	....	1	....
		3 0	0	1	....	....	1	....	....
Total......	....	....	....	27	20	6	35	18	34
Measles...........	Whooping cough..	1 6	1	1	....	....	1	....	....
		2 0	2	1	....	....	1	....	....
		3 0	1	1	....	....	1	....	....
		7 0	30	....	1	....	1	....	....
		1 4	0	1	....	....	1	....	....
		4 0	0	1	....	....	1	....	....
		5 0	0	1	....	....	1	....	....
		2 0	49	....	1	....	1	....	....
		4 0	0	1	....	....	1	....	....
		2 0	29	....	1	....	1	....	....
		2 0	62	....	1	....	....	1	....
		2 0	25	....	1	....	....	1	....
		1 0	3	1	....	....	1	....	....
		3 0	2	1	....	....	1	....	....
		4 0	0	1	....	....	1	....	....
		2 0	0	1	....	....	1	....	....
		1 0	0	1	....	....	1	....	....
		5 0	0	1	....	....	1	....	....
		2 0	3	1	....	....	1	....	....
		4 0	0	1	....	....	....	1	....
		3 0	33	....	1	....	....	1	....
		3 0	3	1	....	....	1	....	....
		2 0	23	....	1	....	1	....	....
		3 0	1	1	....	....	1	....	....
		8 0	7	1	....	....	....	1	....
		4 0	21	1	....	....	1	....	....
		3 0	54	....	1	....	1	....	....
		5 0	0	1	....	....	1	....	....
		2 0	8	1	....	....	....	1	....
		3 0	24	....	1	....	1	....	....
		4 0	6	1	....	....	1	....	....
		2 6	3	1	....	....	1	....	....
		6 0	5	1	....	....	1	....	....

TABLE 43.—*Cross infections for five years ening July 1, 1916*—Continued.

Disease for which admitted.	Secondary infectious disease developed in hospital.	Age of patient.		Number of days between admission and second infection.	When exposed to second infection.			Result.		Death rate per 100 cases.
		Yr.	*mo.*		Before admission.	After admission.	Doubtful.	Recovered.	Died.	
Measles	Whooping cough	2	0	39		1		1		
		7	0	14			1	1		
		2	0	0	1			1		
		4	0	30		1		1		
		4	0	10	1			1		
		3	0	26		1		1		
		2	0	0	1			1		
		6	0	0	1			1		
		4	0	0	1			1		
Total					29	12	1	36	6	14
Measles	Mumps	4	0	19			1	1		
		5	0	10	1			1		
		5	0	19			1	1		
		5	0	10			1	1		
		3	6	7			1	1		
Total					1		4	5		0
Measles	German measles	4	0	21		1		1		
		4	0	46		1		1		
		3	0	12			1	1		
Total						2	1	3		0
Measles	Chicken pox	1	0	16			1	1		
		3	0	31		1		1		
		3	0	10	1			1		
		4	0	10	1			1		
		2	0	0	1			1		
		1	0	3	1			1		
		2	0	9	1			1		
		5	0	127		1		1		
		1	6	3	1			1		
		1		0	1			1		
Total					7	2	1	10		0
Scarlet fever	Measles		11	18			1	1		
		5	0	22		1			1	
		4	0	24		1		1		
		2	0	39		1		1		
		7	0	45		1		1		
		3	0	14			1	1		
		2	0	1	1				1	
			11	21		1		1		
		2	0	19		1		1		
		4	0	25		1		1		
		4	0	20		1		1		
		1	6	16			1	1		
		4	0	25		1		1		
		1	0	10	1				1	
		3	0	10	1				1	
		3	0	21		1			1	
		2	0	3	1				1	
		1	6	8	1				1	
		10	6	0	1			1		
		3	0	19		1		1		
		3	0	0	1			1		
		4	0	3	1			1		
		4	0	10	1			1		
		6	0	20		1		1		
		4	6	12			1	1		
		21	0	39		1		1		
		4	0	6	1			1		
		2	0	15			1		1	
		2	6	9	1			1		
		23	0	11	1			1		
		3	0	0	1				1	
		3	0	23		1		1		
		4	0	10			1	1		
		3	0	3	1			1		

TABLE 43.—*Cross infections for five years ending July 1, 1916*—Continued.

iscase for which admitted.	Secondary infectious disease developed in hospital.	Age of patient.		Number of days between admission and second infection.	When exposed to second infection.			Result.		Death rate per 100 cases.
		Yr.	*mo.*		Before admission.	After admission.	Doubtful.	Recovered.	Died.	
carlet fever......	Measles...........	6	0	8	1	....	....	1	....	....
		4	0	35	....	1	....	1	....	....
		2	0	0	1	....	....	1	....	....
		2	6	13	1	....	....	....	1	....
		3	0	13	1	....	....	1	....	....
		3	0	3	1	....	....	1	....	....
		3	0	4	1	....	....	....	1	....
		5	0	36	....	1	....	1	....	....
Total.......	....	....		....	20	16	6	31	11	26
carlet fever......	Diphtheria........	2	0	0	1	....	....	....	1	....
		4	0	0	1	....	....	1	....	....
		5	0	5	....	....	1	....	1	....
		4	0	0	1	....	....	....	1	....
		5	0	8	....	1	....	1	....	....
		7	0	0	1	....	....	....	1	....
		4	0	2	1	....	....	1	....	....
		11	0	25	....	1	....	1	....	....
		4	0	46	....	1	....	....	1	....
		3	0	13	....	1	....	....	1	....
		6	0	0	1	....	....	[1] 1	....	....
		5	0	0	1	....	....	[1] 1	....	....
		1	0	0	1	....	....	[1] 1	....	....
		25	0	0	1	....	....	[1] 1	....	....
		18	0	0	1	....	....	[1] 1	....	....
		3	0	0	1	....	....	....	[2] 1	....
		6	0	0	1	....	....	[1] 1	....	....
		4	0	0	1	....	....	[1] 1	....	....
		6	0	0	1	....	....	[1] 1	....	....
		5	0	0	1	....	....	[1] 1	....	....
			7	0	1	....	....	....	[2] 1	....
Total.......	....	....		....	16	4	1	13	8	38
carlet fever......	Whooping cough..	6	0	0	1	....	....	1	....	....
		6	0	2	1	....	....	1	....	....
		2	0	23	....	1	....	1	....	....
		3	0	27	....	1	....	1	....	....
Total.......	....	....		....	2	2	....	4	....	0
carlet fever......	Mumps...........	6	0	1	1	....	....	1	....	....
		3	0	40	....	1	....	1	....	....
Total.......	....	....		....	1	1	....	2	....	0
carlet fever......	German measles...		9	30	....	1	....	1	....	....
		3	0	34	....	1	....	1	....	....
Total.......	....	....		....	....	2	....	2	....	0
carlet fever......	Chicken pox......	5	0	0	1	....	....	1	....	0
iphtheria........	Measles...........		11	17	....	....	1	1	....	0
iphtheria........	Scarlet fever.......		6	13	....	1	....	....	1	....
		2	0	0	1	....	....	....	1	....
		2	0	9	....	1	....	1	....	....
		7	0	3	1	....	....	....	1	....
		2	6	0	1	....	....	....	1	....
Total.......	....	....		....	3	2	....	1	4	80
erman measles..	Diphtheria........	4	0	3	1	....	....	1	....	0
hooping cough.	Measles...........	3	0	9	1	....	....	1	....	....
		5	0	30	....	1	....	....	1	....
		4	0	27	....	1	....	1	....	....
		2	0	4	1	....	....	....	1	....
		5	0	30	....	1	....	1	....	....
			10	5	1	....	....	1	....	....
Total.......	....	....		....	3	3	....	4	2	33

[1] Simultaneous.

TABLE 43.—*Cross infections for five years ending July 1, 1916*—Continued.

Disease for which admitted.	Secondary infectious disease developed in hospital.	Age of patient.	Number of days between admission and second infection.	When exposed to second infection.			Result.		Death rate per 100 cases.
				Before admission.	After admission.	Doubtful.	Recovered.	Died.	
		Yr. mo.							
Chicken pox	Measles	3 0	11			1	1		
		2 0	1	1			1		
		6	5	1			1		
Total				2		1	3		0
Measles	Vulvo vaginitis	1 8	7		1		1		
		3 0	10		1		1		
		1 8	10		1		1		
		4 0	23		1		1		
		2	5		1		1		
		3 0	10		1		1		
		1 8	18		1		1		
		6 0	10		1		1		
		8 0	0	1			1		
Total				1	8		9		0
Scarlet fever	Vulvo vaginitis	2 0	4			1	1		0
Obs. fever	Vulvo vaginitis	5 0	6			1	1		
		3 0	8		1		1		
		3 6	4			1	1		
			7		1		1		
Total					2	2	4		0
Whooping cough	Vulvo vaginitis	2 0	0	1			1		0
	Chicken pox	4 0	5	1			1		0
Mumps	German measles	3 0	7	1			1		0
Chicken pox	Scarlet fever	10	0	1			1		
		3 0	0	1			1		
		3 0	6			1	1		
		3 0	1	1			1		
Total				3		1	4		0
Nephritis	Diphtheria	10	13		1		1		100

TABLE 41.—*Summary of foregoing table to show the incidence of cross infection on the basis of admissions to the different departments of the hospital.*

Total admissions to all departments of the hospital for all causes	6,078
Total admissions to contagious-disease wards, including accompanying relatives.	4,900
Total admissions to contagious-disease wards, exclusive of accompanying relatives	4,246
Total cross infections	252
Total cross infections known to have been contracted in hospital	83
Total cross infections known to have been contracted before entering hospital	138
Total cross infections of doubtful origin	31
One-half of the 31 of doubtful origin arbitrarily placed with those known to have been contracted in hospitals, making total contracted in hospital	99
Percentage of cross infections contracted in hospital on basis of all admissions	1.6
Percentage on basis of admissions to contagious-disease wards only including accompanying relatives	2
Percentage on basis of admissions to contagious-disease wards, exclusive of accompanying relatives	2.3

VII. SUMMARY OF THE MOST IMPORTANT STATISTICAL DATA IN ITS BEARING UPON THE DIFFERENT CONTAGIOUS DISEASES AS PERSONALLY OBSERVED FOR A PERIOD OF FIVE YEARS.

Having discussed in considerable detail the influence of age, weather, complications, and cross infections upon the incidence and prognosis of the principal contagious diseases of childhood, it is now pertinent to study each particular disease in the light of these influences. By studying the statistics of these diseases as they were compiled from the case histories of patients in the hospital, one may form valuable general conclusions; but it is only by such a study combined with personal observation of the patients themselves, the manner in which their histories were taken, and the general hospital management and environment that one is enabled properly to interpret these general conclusions. In the pages immediately following such an interpretation is attempted.

MEASLES.

Statements as to the mortality of measles show a great difference of opinion among authors. Thus Holt, in his "Diseases of Infancy and Childhood," places the general case fatality at from 4 to 6 per cent, and that of institutions at from 10 to 35 per cent.[2] A study of the vital statistics of the various cities and States in the United States shows that the general mortality at the present time is not nearly so high as it was when Holt made this statement. In 1913, in the city of New York, the fatality rate per 100 cases was only 2.15, and even this was higher than that of any other city with a population of 500,000 or over. In 1914 there were 170,004 cases of measles reported to the health authorities in 28 States and Territories; 2,905 of these died, giving a case fatality of 1.73 per cent.[3] It would seem that we are well within the limits of conservatism if we place the present case fatality rate of measles throughout the United States at less than 2 per cent. However, mortality from measles is less at the present time than it has been. This is indicated by a comparison of recent vital statistics with those presented by Frederick S. Crum, assistant statistician for the Prudential Life Insurance Co., in a paper read before the American Public Health Association in 1913. His figures showed a much higher death rate from measles in the United States than has prevailed since the presentation of this article. At that time he said, "The most reliable international mortality statistics show that on an average, in the countries of the temperate zones, more than 1 per cent of all deaths are caused by measles. In the registra-

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[1] A portion of the material produced under this heading appeared in the Archives of Pediatrics for April, 1917, Wilson, "Measles from the Standpoint of Prevention."

[2] Holt, "Diseases of Childhood and Infancy," pp. 940–941.

[3] Reprints from Public Health Reports, Nos. 208–298.

tion area of the United States the percentage which measles contributed to the total mortality during 1906 to 1910 was 0.71. During 1900 to 1911, 50,000 deaths were recorded from measles in the registration area of the United States." [1]

The mortality from measles is almost uniformly higher in institutions than in private practice. The following figures are taken from Nothnagel's "Encyclopedia of Practical Medicine," and are given on the authority of Northrup and von Jürgensen: In 1897, 258 cases at the New York Foundling Hospital gave a case fatality of 13.9 per cent. The Charité Hospital, a German institution, yielded a case fatality of 30.3 per cent out of a total of 294 cases between 1888 and 1890, while 453 cases at Friedrichsain from 1886 to 1890 gave a case fatality of 22.6 per cent. It is impossible to imagine any more unfavorable conditions for recovery from measles than to be taken sick in the steerage in transit to the United States, and then, either in the height of the disease or before convalescence is well established, to be transported in overcrowded barges from the New York City docks to the immigrant station at Ellis Island. Besides the unfavorable sanitary conditions necessarily surrounding this procedure, the patient has almost invariably been exposed to the risk of cross infection before he reaches the hospital. Notwithstanding these facts, the case fatality of measles at the contagious-disease hospital at Ellis Island has averaged less than 9 per cent from the time the hospital was opened.

A study of our cases shows rather conclusively that age was a factor of great importance in determining the prognosis. Not only were those cases which were complicated with another contagious disease unfavorably influenced by tender age, but the uncomplicated ones showed this same tendency. Notwithstanding these facts the mortality at different periods varied too much to be explained by the factor of age alone.

It is quite evident that the disease has no fixed case-fatality rate even when immense numbers are used as a basis of calculation. There is probably some as yet undetermined factor, entirely apart from age and unfavorable surroundings, which enters into the situation and makes the disease now a mild one with easy recovery and now a virulent one with a high incidence of complications and death. That some undetermined factor is at work is shown not alone in its variable case-fatality rate, but also in its incidence rate. Paul Th. Müller, in speaking of the periodicity of measles epidemics, cites Gottstein's investigations of this subject in 14 European cities (among which were London, Paris, Berlin, and Stockholm) as tending to establish the view that periodic epidemic outbreaks tended to recur at three to five year intervals. The incidence of measles cases as thus investigated by Gottstein covers a period of 11 years.[1] The regularity of the recurrence of the epidemics is graphically illustrated in Chart No. 2. In this country the periodicity of measles outbreaks has often been noted. Chart No. 3 (published by the Prudential Life Insurance Co.) shows a graphic compilation of the periodicity of measles epidemics in 15 American cities. Levy, of the health department of Richmond, Va., studied the death rate from measles in that city for a period of 30 years and noted a periodicity in the virulence of the outbreaks which led him to successfully predict almost the exact mortality for three successive

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[1] Frederick S. Crum, "A Statistical Study of Measles," American Journal of Public Health, Vol. IV, No. 4.

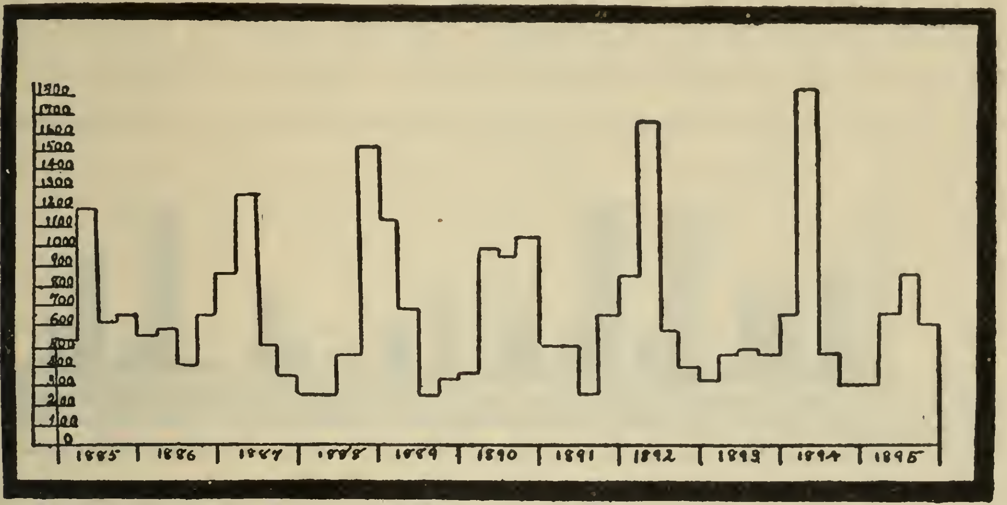

CHART No. 2.—Curve showing the periodicity of measles epidemics as illustrated by the combined table of measles morbidity in 14 European cities.—Paul. Th. Muller.

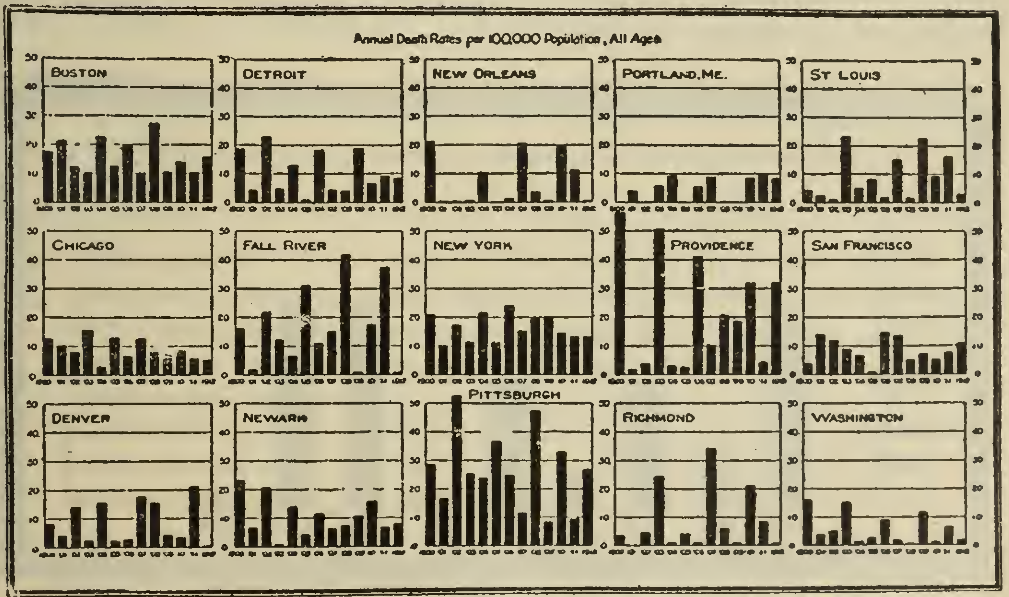

CHART No. 3.—Periodicity of measles epidemics—fifteen representative American cities.

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[1] Paul Th. Müller, Vorlesungen uber Allegemeine Epidemologie (Jena, 1914), pp. 205–206.

years. (Chart No. 4.) Although Levy's tables have more to do with the virulence of the epidemic than the number of cases, an examination of his reports shows that, as a rule, those years with a very low case fatality were those of a low incidence of the infection, and thus his figures go to establish the view that an interval of at least two years occurs between severe measles epidemics in the city of Richmond.[1] In New York City the periodicity has been marked, but the time interval has been less than in most other cities. From 1873 to 1903 measles recurred in regular two-year waves—one year of epidemic followed by an off year. There were only two exceptions to this biannual periodicity in the whole 30 years.[2] In Cincinnati the general tendency has been to every-other-year epidemics similar to New York. (Chart No. 5.)

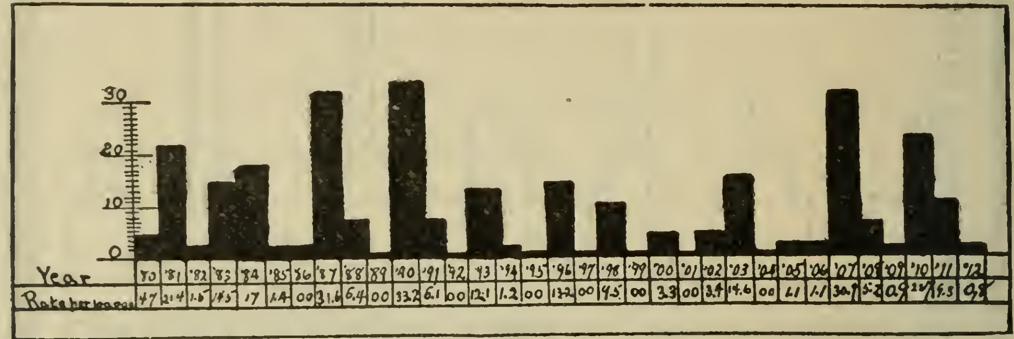

Chart No. 4.—Annual death rate from measles per 100,000 population in the city of Richmond, Va., 1880–1912.—Dr. E. C. Levy.

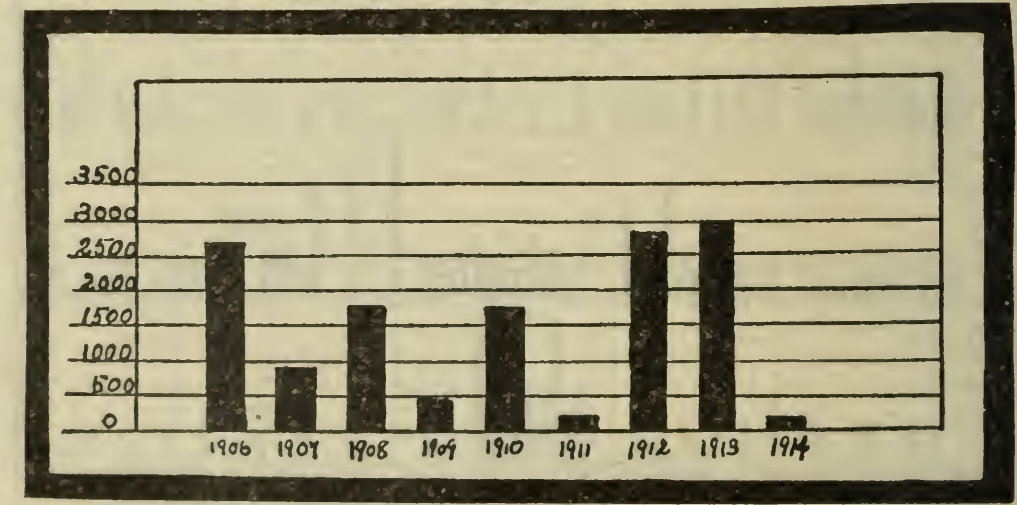

Chart No. 5.—Number of cases of measles reported in Cincinnati, 1906–1914.

Various explanations have been advanced for the regular periodical recurrence of measles epidemics in the same community. Von Jürgenson doubts that there is such a rhythmic periodic recurrence for any given community, and bases his disbelief in such a theory on the fact that he observed no such phenomenon at Tübingen over a long period of years.[1] Crum dismisses the theory of periodicity by the statement that statistical investigations show that when 30 per cent of a given population have not been exposed to the disease a general epidemic may be expected,[2] but he fails to give the data on which his statement is based, and in view of the difficulties attending the collection of such material on a sufficiently large scale to be of any value, it is difficult to see how such a theory could ever be proven. Müller advances a similar hypothesis to that of Crum, only he is not so definite in his statements of the number of susceptible persons required to make an epidemic. He says that a measles outbreak in a given community either actually attacks or immunizes the whole susceptible population and that the off years following the epidemic simply represent the time required for a new susceptible generation to come into existence.[3] If this theory were correct, it would seem that in a continuously susceptible population the yearly morbidity from measles would remain practically constant. Although it is obviously impossible to say with certainty that the immigrant population passing through Ellis Island is continuously susceptible to measles, it would seem likely that such was the case. It represents children of all ages picked up more or less at random from widely separated European communities, and we could certainly never find a more continuously susceptible population than that which is thus gathered together on board the steerage ships. Notwithstanding this constancy of the proportion of susceptible persons passing through Ellis Island the annual morbidity from measles has varied from 0.56 to 1.67 per 1,000 immigrants during the last 15 years. This is shown graphically in chart No. 6. That this variation is not dependent upon the varying proportion of children among the immigrants will be made apparent by inspection of chart No. 7. The exact proportion of children to the total number of immigrants is not available before

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[1] E. C. Levy, Annual Reports, Health Department, City of Richmond, Va., 1909–1912.

[2] Annual Report, Department of Health, New York City, 1904.

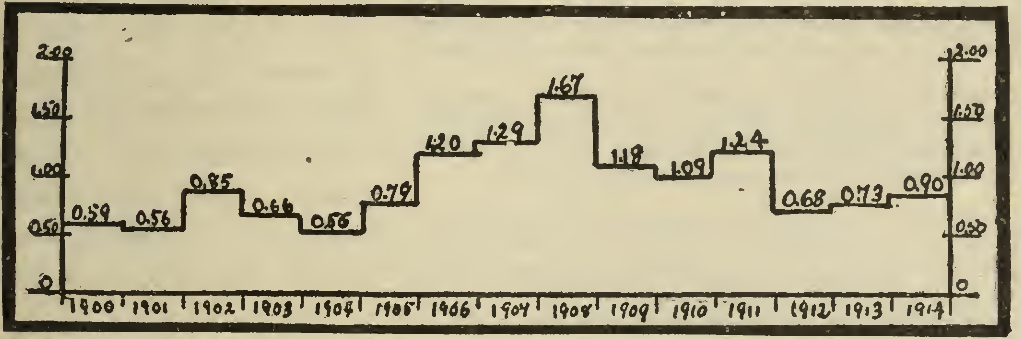

Chart No. 6.—Number of measles cases per 1,000 immigrants arriving at Ellis Island, 1900–1914.

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[1] Von Jürgensen, Nothnagel's Encyclopedia of Practical Medicine, "Diphtheria, Scarlet, and Measles," p. 230.

[2] Frederick S. Crum, "A Statistical Study of Measles," American Journal of Public Health, Vol. IV No. 4.

[3] Paul Th. Müller, Vorlesungen uber Allgemeine Epidemologie (Jena, 1914), p. 206, et seq.

the year 1906, but since that time it can be seen that the proportion of children to the total number of immigrants has borne an inconstant relation to the yearly variations in measles morbidity.

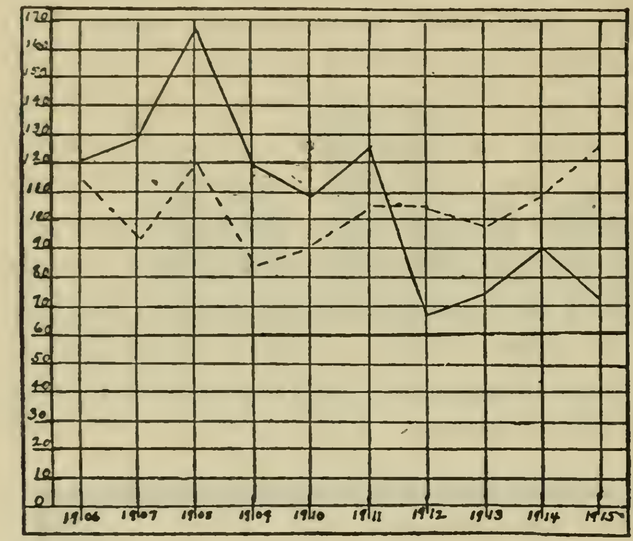

Chart No. 7.—Solid line, number of measles cases per 100,000 immigrants arriving at Ellis Island, 1906–1915; broken line, number of persons under 14 years of age per 1,000 immigrants arriving at Ellis Island, 1906–1915.

A study of all the available data simply establishes the fact that measles epidemics show a periodicity of recurrence, and that this periodicity seems to vary in different places. The underlying reason of this phenomenon has not yet been solved. There is only one factor which appears to bear a constant causal relation to epidemics of measles, and even this is incapable of explaining it in its entirety. This factor is overcrowding. Williams showed very clearly how this influenced the situation at Ellis Island in the detention rooms for immigrants,[1] and the same problem was worked out by the health authorities in Glasgow, where both the incidence and the fatality of the disease was shown to bear a direct relation to the number of rooms occupied by the family. (Chart No. 8.)[2]

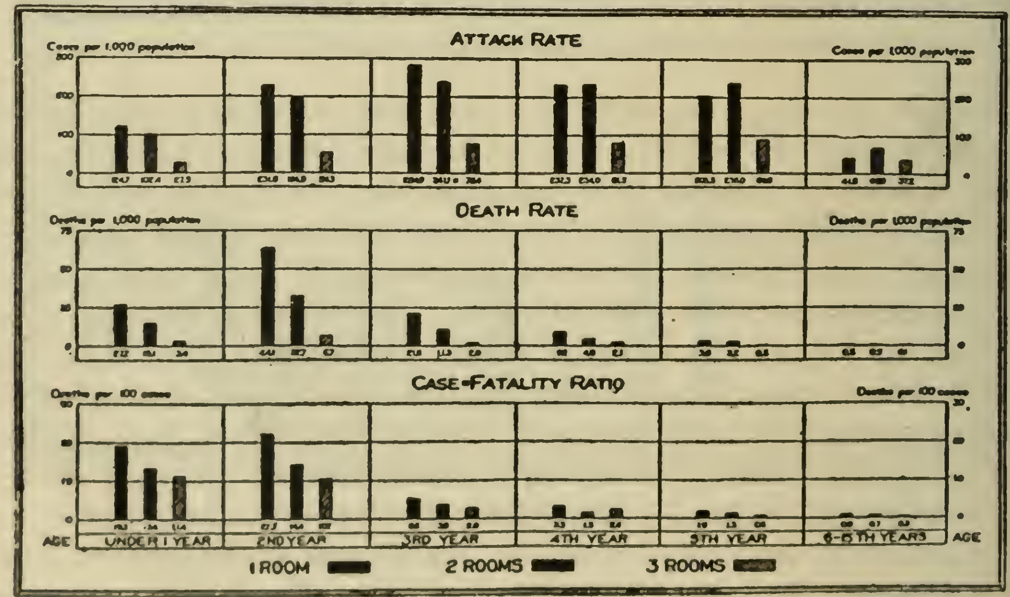

Chart No. 8.—Relation of housing to measles—Glasgow, Scotland, 1908.

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[1] L. L. Williams, "The Alien in Relation to the Spread of Contagious Diseases," New York Medical Journal, June 20, 1914.

[2] Publication of the Prudential Insurance Co. of America.

There can be no doubt that more success has heretofore actually attended home treatment than hospital, but it can be shown that when hospital conditions are changed so that isolation facilities are adequate, just as great success will attend this method of treatment. There have not yet been constructed any hospitals with absolutely adequate isolation facilities. By such hospitals are meant those in which it is never necessary to take any chances of patients directly infecting each other. This means that every child must be kept in isolation for a length of time that not only absolves it as a source of danger on account of the disease for which it has been treated, but also covers the incubation period of every contagious disease which it has not had.

At Ellis Island Hospital there has been an effort to achieve this ideal, but so far it has not been reached. There has, however, been great improvement. If we compare the years when isolation facilities have been decidedly inadequate with those when they have been considerably better, the improvement in the results is so marked that one can not help but believe that it will eventually be entirely possible to eliminate every objection that may be raised to hospital treatment.

The five years elapsed since the hospital was opened July 1, 1912, divide themselves into two distinct groups so far as isolation facilities are concerned.

In 1912 there were only 633 admissions for all causes. Five hundred and two of these were measles, leaving approximately only one-sixth of the hospital population as a possible source of cross infection with measles. Moreover, the admissions were usually in small groups, so that the hospital accommodations were seldom overtaxed. The year 1912, therefore, can be classed as a year with fairly good isolation facilities because there was provision for keeping this one-sixth of the population away from the rest during the greater part of the convalescent period of both groups.

In 1913 and 1914 the isolation facilities were relatively poor. In these two years there were 2,256 admitted for all causes; 1,675 of these were for measles, leaving one-fifth of the hospital population as a possible source of cross infection with measles. Patients suffering from different contagious diseases were often admitted in groups of 20 or more at one time. There were not sufficient facilities even to approximate adequate isolation during the greater part of these two years.

In 1915 the total number of admissions for all causes was only 383. One hundred and ninety-one of these were measles, leaving one-half of the population as a possible source of cross infection with measles. This greater chance was, however, largely offset by the even distribution and small number of admissions, so that isolation facilities in reality approximated those of 1912.

In 1916 the chances of cross infection were the greatest of all. This year there were 960 admissions for all causes, which number almost equaled the yearly admissions in 1913 and 1914. There were 252 measles cases admitted, 22 of which were suffering from a coincident scarlet fever at the time of admission. There were 200 cases of scarlet fever, 11 of whom were suffering from superadded measles. Altogether, there were some 300, or one-third of the hospital population, who were a possible source of cross infection to the measles cases. Besides this, the admissions were very irregular and often in large groups, over 40 cases having been admitted in the course of a few hours on several occasions. Fortunately, 12 more isolation units had been added and it was possible to maneuver so that, except in a few instances, it was not necessary to take chances. Therefore, this year is grouped among those with fair isolation facilities. Arranging these years according to isolation facilities and setting opposite each group the case fatality, serious complications, and cross infections we have the following results:

Group I.—Isolation facilities poor. Comprises years 1913 and 1914, with 1,675 admissions for measles in the two years. Patients were admitted in large groups—often over 20 measles cases in two hours—sometimes 40 or 50, all causes, in a day, as a result of which many cases were admitted and necessarily placed in general ward before diagnosis could be absolutely established. The case fatality for this group was 10 per cent. Broncho-pneumonia and enterocolitis occurred in 21 per cent, and cross infections contracted in hospital in 3.2 per cent of the 1,675 cases.

Group II.—Isolation facilities relatively good. Comprises years 1912, 1915, and 1916, with 949 admissions for measles in the three years. In 1912 the admissions were evenly distributed, seldom coming in large groups, generally less than 20 in any one day, and there was a small number of other contagious diseases besides measles admitted to the hospital. In 1915 the total number of admissions for the year was so low and distribution so even that facilities were, relatively speaking, not overtaxed. In 1916 there was a large number of other contagious diseases and a very uneven distribution of admissions, but this was largely offset by increase in the number of isolation units. The case fatality for this group was 6 per cent. Broncho-pneumonia and enterocolitis occurred in 10.5 per cent and cross infections contracted in hospital in 2.2 per cent of the 949 cases.

It is commonly stated that the incidence of broncho-pneumonia is largely determined by exposure to inclement weather. A study of our cases ought to be particularly valuable to determine the influence of this feature, because, speaking broadly, one might say that the great majority had been exposed to whatever outside weather conditions existed at the time of their admission. A large percentage developed measles on shipboard and were subjected to all kinds of unfavorable weather conditions before admission. Another large percentage developed the diseases in the detention rooms of the immigrant station, where there was much variation both of temperature and air movement. Only a very small number can be said to have been free from exposure to the outside weather conditions existing at the time of their admission. Notwithstanding this fact we found that the incidence of broncho-pneumonia bore only an indifferent relationship to the cold and disagreeable months of the year. Twice during the months of January there developed a much higher rate of illness from broncho-pneumonia than the average rate for the whole period, and if we group the months together for the whole three-year period we find that November and January are the only ones that show any marked deviation above the normal average of approximately 10 per cent. Five years is hardly sufficient time from which to draw final conclusions as to the influence of season on the incidence of broncho-pneumonia as a complication of measles, but so far as our figures go they seem to indicate that this influence is small.

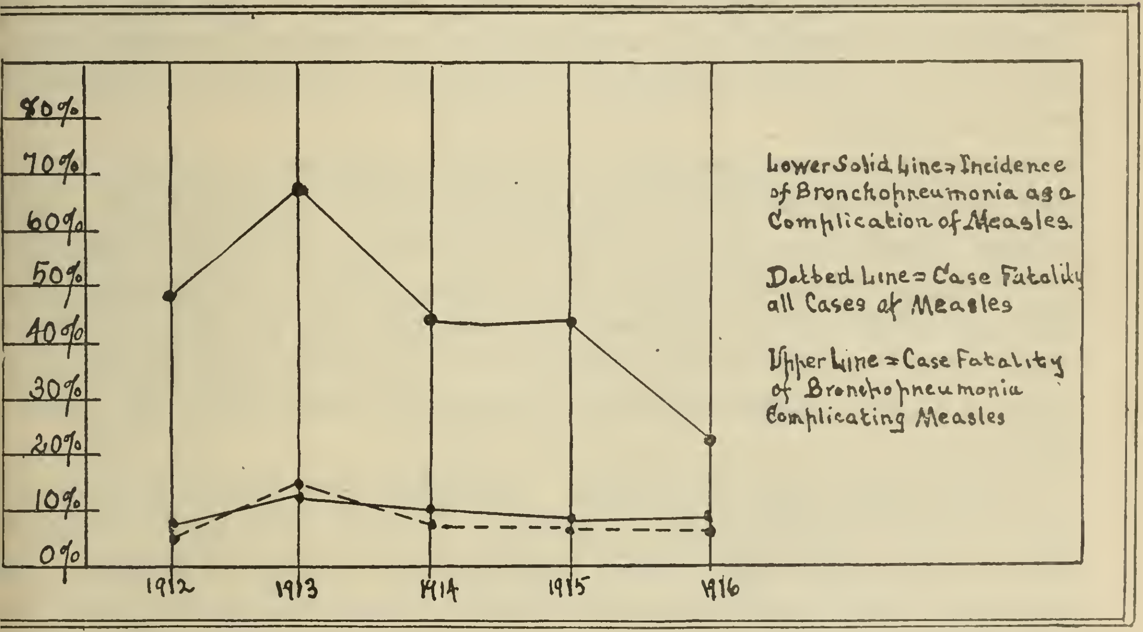

CHART No. 9.—Incidence and case fatality of bronchopneumonia complicating measles in relation to the total case fatality of measles by years.

A greater influence would seem to be exerted by some unknown factor which determines the general severity of the epidemic. This is graphically shown in charts Nos. 1 and 9, where the general relation of illness from broncho-pneumonia and the total case fatality from measles is an exceedingly close one. The close relationship of these two curves is apparently entirely independent of the curve which shows the case fatality of broncho-pneumonia. These two charts show the lack of relationship between deaths from broncho-pneumonia complicating measles and the deaths from measles due to all causes.

Roughly speaking, 58 per cent of the broncho-pneumonia cases died, but note the wide fluctuations from the average. Also, in general terms, 10 per cent of the measles cases died, but here the deviations are not so great, and they follow the deviations in the incidence curve of broncho-pneumonia almost exactly. The obvious inference from these figures is that in a given series of cases the prevalence of broncho-pneumonia rather than the deaths from broncho-pneumonia will indicate the total measles fatality. In other words, the prevalence of broncho-pneumonia is an index of the severity of an epidemic, and the conditions which make good soil for broncho-pneumonia also predispose to an unusual number of cross infections and fatal complications of measles other than broncho-pneumonia. Our experience would lead us to believe that, generally speaking, every recovery from measles and broncho-pneumonia is balanced by a death from measles with some other complication. Consequently the problem in the treatment of measles is not so much the treatment of broncho-pneumonia as it is the determination of the reasons why different epidemics vary in virulence.

Among the complications of measles, suppurative otitis media was the most frequent and broncho-pneumonia the most fatal. The former occurred in 18 per cent of the cases. Although a frequent complication and rather difficult to cure, it did not add materially to the case fatality rate. Indeed, it seems that the incidence of otitis media does not bear much relation one way or the other to the case fatality in the measles patients which have come under our observation.

In the 2,614 cases considered, mastoiditis was operated upon 29 times; 25 of these patents recovered. The ones who died developed some other complication apart from the ear or mastoid trouble. It happened that only one measles death of the whole series could be reasonably attributed directly or indirectly to any ear complication. Except in a very few instances the otitis cases were kept in the hospital until all discharge from the ear had ceased and the recovery of the patient had been in every way effected, consequently it can not be objected that our patients passed from observation too soon to warrant an opinion as to the gravity of the ear complication.

Summary.—From a study of 2,614 cases of measles occurring over a period of five years, together with a survey of the literature, it seems that although both the incidence and case fatality of this disease are greatly influenced by age, there are other more important factors not yet undertsood which determine both the virulence and periodicity of epidemics.

From a study of our cases alone as they occurred in hospital, the following conclusions are drawn:

1. Cross infection, especially that of diphtheria, was the most serious event that occurred in the course of measles.

2. Broncho-pneumonia complicated 10 per cent of all the cases, being but little influenced by weather conditions in the frequency of its occurrence or its case fatality.

3. The case fatality of measles complicated with broncho-pneumonia was 50 per cent, but it varied in an erratic manner and without marked relation to the total case fatality of measles.

4. The incidence rate of broncho-pneumonia as a complication rather than its case fatality appeared to be an index to the severity of any particular outbreak of measles.

5. Proper isolation facilities greatly reduced the incidence of cross infections and complications and had a directly favorable influence upon prognosis.

6. Suppurative otitis media, although the most frequent complication of measles, was not of grave prognostic import.

SCARLET FEVER.

The influence of age upon the incidence and prognosis of scarlet fever was marked. There were altogether 530 cases. The age distribution was as follows: Thirty-six, or 7 per cent, were under 2 years of age; 341, or 64 per cent, were between 2 and 8 years old; 78, or 15 per cent, were between 8 and 14 years old; 75, or 14 per cent were over 14 years of age.

The case fatality was highest in the group under 2 years of age. It differed from measles in that the second rather than the first year of life was the most fatal period. Thirty-three per cent of the cases under 1 year old died; 55 per cent of the cases between 1 and 2 years old died; 38 per cent of the cases between 2 and 3 years old died; 15 per cent of the cases between 3 and 7 years old died; 4 per cent of the cases between 7 and 14 years old died; 5 per cent of the cases over 14 years old died. After the age of 7 years the prognosis was practically the same as for adults.

The influence of season upon the incidence of scarlet fever was much greater than upon that of measles. Sixty-five per cent of the cases occurred during the months from November to April, inclusive. Season had apparently little influence upon the severity of the individual attacks.

Except in those cases where there was cross infection the determining cause of death was in most instances directly connected with the virulence of the disease, the fatality occurring within a few days, sometimes with and sometimes without an accompanying broncho-pneumonia.

Nephritis and suppurative otitis media, which are usually considered serious complications, were seldom fatal in our cases. The former occurred 38 times with 2 deaths, the latter 100 times with 1 death. The incidence of suppurative otitis media was exactly the same as in measles, 18 per cent of the cases having suffered from this complication in both diseases.

The severity in suppurative otitis media appeared to be greater than in measles, lasting longer and being more intractable to treatment. Eight of these cases, or 1.6 per cent, required a mastoid operation as contrasted with 29 or 1.1 per cent of the measles cases.

Broncho-pneumonia gave a case fatality of 40 per cent, which was 10 per cent lower than the same complication in measles.

If we discount the terminal broncho-pneumonias, which should in reality be considered as a sign of approaching death from general toxemia rather than the actual cause of death itself, it is found that those cases complicated with another cross infection offered the most unfavorable prognosis of the whole series. Twenty-six per cent of the scarlet fevers complicated with measles died; 43 per cent of those complicated with diphtheria died.

For the whole five-year period the case fatality was 16.6 per cent. There were great variations from this general average. For example, in 1913 the case fatality was 30 per cent, which was three times as high as in 1912 and six times as high as in 1916. This great variation in virulence was the most striking feature of our cases. A simple reference to the statistics only gives one a faint conception of its importance. In order thoroughly to appreciate just what epidemiological significance should be attached to the occurrence of mild cases of scarlet fever one must have actual experience with many epidemics of varying virulence.

During the prevalence of epidemics of undoubted scarlet fever (either in mild or severe form, but more frequently during the mild epidemics) there often came under our observation patients with slight elevation of temperature, accompanied by a fleeting erythema of irregular distribution and often confined to the forearms and legs. These patients sometimes had no throat symptoms whatever, and the temperature frequently reached the normal within 48 hours. However, when carefully observed for a period of from two or three days to a week or 10 days, they were invariably found to undergo desquamation in those situations where the erythema had been observed.

The extreme liability to overlook such cases was illustrated in many ways and on many different occasions. For example, a girl of 7 years was admitted with a temperature of 105, but with no pain or apparent discomfort in any situation. The tongue was heavily coated. There was no rash nor apparent desquamation in any situation. Although there was no pain or tenderness about the ears, both drums were red and bulging. After the drums were opened the temperature promptly fell to almost normal. Seven days after admission, careful examination showed a fine desquamation upon the abdomen and in another two days the whole body, including the toes and fingers, were desquamating in a manner indicating that she had recently had a typical scarlet fever of moderate severity.

Another case was that of a young man, 21 years old, admitted for a mild pharyngitis and tonsilitis. There was a fleeting erythema noted on the arms and buttocks. This entirely disappeared in a few hours. At the end of 24 hours the patient's temperature, which had never been over 101, was normal and he was about to be discharged as a recovered case of mild pharyngitis when, on account of the prevalence of scarlet fever of a severe type it was decided to keep him under observation for a few days longer. One week after the onset of the pharyngitis desquamation was first noticed on the arms. Two days later there was also desquamation upon the abdomen and other parts of the body where the occurrence of rash had been so fleeting that it had been entirely overlooked.

Our clinical records show many cases similar to the foregoing. On account of this experience we have come to regard every case of illness from ill-defined cause (however slight) as a scarlet fever suspect, provided it occurs during a period when undoubted scarlet fever is prevalent. Such suspects are positively diagnosed as scarlet fever when after a variable period, but one not exceeding 10 days from the onset, there is visible desquamation on any appreciable area of the body. The strawberry tongue and peeling of fingers may or may not be present.

If the assumption is correct that such mild cases occurring during scarlet fever epidemics are in reality scarlet fever, the relative immunity to this disease which 20 to 50 per cent of children and the great majority of adults enjoy is readily explained on the ground that such immunity has been acquired by a previous attack.[1]

Summary.—1. The incidence of scarlet fever was greatest during the winter months.

2. The liability to the disease was greatest between the ages of 2 and 8 years.

3. The case fatality was highest in the second year of life.

4. After 7 years of age the case fatality was practically the same for all ages.

5. Complications, though rendering convalescence slow, were not the usual cause of death.

6. The case fatality was determined chiefly by the virulence of the epidemic and the incidence of cross infection.

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[1] Chapin, in "Sources and Modes of Infection," p. 154, expresses the opinion that of children between 2 and 6 years old exposed to scarlet fever only about 1 in 5 contract the disease. For adults he places the ratio at 1 to 40. Holt, "Diseases of Infancy and Childhood," p. 953, says that approximately not more than one-half of the children exposed take the disease.

7. Diphtheria occurring in the course of scarlet fever more than doubled the liability to death.

8. The virulence of the infection varied greatly in different epidemics and to a less extent during the same epidemic.

9. The inference seems warranted that the majority of adults enjoy immunity to scarlet fever on account of a previous attack, whether recognized as such or not.

DIPHTHERIA.

The high case fatality—25.7 per cent—was partly due to the fact that many cases were in extremis when admitted. Patients admitted in the early stages of the disease usually recovered.

The influence of age upon both the incidence and prognosis of diphtheria was marked. There were altogether 70 patients in whom the primary diagnosis was diphtheria. Eight, or 11.5 per cent, were under 1 year of age; 1, or 1.5 per cent, was between 1 and 2 years of age; 38, or 54 per cent, were between 2 and 8 years old; 7, or 10 per cent, were between 8 and 14 years old; 16, or 23 per cent, were over 14 years of age.

The case fatality was highest in the group under 3 years of age. Although the disease was nearly twice as fatal as scarlet fever, the relative influence of age upon prognosis up to the seventh year of age was about the same for both diseases. Sixty-two per cent of the cases under 1 year old died; 100 per cent of the cases between 1 and 2 years old died; 66 per cent of the cases between 2 and 3 years old died; 23 per cent of the cases between 3 and 8 years old died; of the 23 patients over 8 years of age, none died.

The number of cases considered is too small to draw definite conclusions concerning the influence of season upon the prevalence of diphtheria. July, November, and December were the months which gave the greatest numbers. November was the only month which yielded one or more cases every year for the whole five years.

The case fatality was decidedly less in the summer than winter. There were no deaths from diphtheria as the primary cause during July and August of any of the five years. Even when diphtheria occurred as a crossed infection the prognosis was from two to three times more favorable in summer than winter.

The determining cause of death was in most instances directly due to the toxemia. Except in those cases where scarlet fever followed in the wake of the disease, late complications did not often result fatally.

Diphtheria occurring as a secondary infection was extremely fatal. This was especially true when it followed measles, or accompanied scarlet fever, the mortality being in both instances approximately 50 per cent. Consideration of the extreme gravity of diphtheria when it accompanies or follows other infections naturally leads to the study of how the virus of the disease is conveyed from persons to person and its rate of transmission. A considerable proportion of all immigrants harbored the diphtheria bacillus. This proportion varied from time to time and apparently bore some relation to the prevalence of clinical diphtheria.

For example, during May, June, and July, 1915, out of 212 patients who had nose and throat cultures taken on admission to the hospital, there were 19 who showed the presence of the Klebs-Lloffler bacillus and 10 of these had signs of clinical diphtheria as well. Subtracting the 10 genuine diphtherias from the total, we have 4.4 per cent of the nondiphtheritic cases which were diphtheria carriers. Immediately following this small epidemic of diphtheria and diphtheria carriers, nose and throat cultures were taken from the Ellis Island population as follows:

July 30.—Sixteen healthy immigrants immediately after arrival at Ellis Island gave five positive cultures.

August 6.—Thirty-one healthy immigrants (30 children and 1 woman) in the detention quarters gave eight positive cultures.

August 7.—Ten patients in wards of the contagious-disease hospital gave one positive culture. These patients had all had negative cultures on admission some days previously. The one positive result showed no clinical signs of diphtheria.

August 7.—Seven doctors and nurses in the contagious-disease hospital all showed negative cultures.

August 7.—Twenty-two patients from the men's eye ward in the general hospital showed five positive cultures. None of these had sore throat at the time, but the next day one of the negative cases developed sore throat and a culture taken that day was positive. All the men in this ward had been in the general hospital for many days and some of them for several months.

August 10.—Eighteen women and children, newly arrived immigrants, all showed negative cultures immediately upon arrival.

August 10.—Two attendants whose duties had for many months thrown them in intimate contact with newly arriving immigrants both showed negative cultures.

With the exception of one of the negative cases from the men's eye ward, mentioned before, none of the foregoing cases in this group (from July 30 to August 10 inclusive) showed any clinical signs of diphtheria.

Summarizing the foregoing data we find that of 318 nose and throat cultures taken from the population of Ellis Island during the spring and summer of 1915, 38 or 12 per cent were positive. Of the positive cases only 10, or approximately one-fourth, had clinical signs of diphtheria, and in no instance did a positive diphtheria carrier—that is one without clinical signs of diphtheria at the time the culture was taken—subsequently develop any clinical signs of the disease.[1]

Although this series of cases illustrates well our usual experience, that a positive diphtheria culture has but little if any diagnostic value unless accompanied by clinical signs of diphtheria, it is not meant to be inferred that the routine taking of throat cultures is a practice which should be abandoned. So long as hospital facilities are such that the grouping of children together in common wards must be practiced, just so long must every means be taken to cull out every possible source of diphtheritic infection. The aid given by examination of throat cultures is not to be decried, but if reliance be placed upon the laboratory reports alone, one will often find that he has become unduly alarmed by the fact that one or more children in a ward are reported to be diphtheria carriers. On the other hand, if one relies exclusively on the fact that all throat cultures are reported negative he will fall into the more grievous error of neglecting a daily examination to detect the first clinical signs of diphtheritic infection.[2]

That single negative cultures are not to be depended upon to determine the absence of a severe diphtheritic infection was shown time and again in the course of our experience. The following are a few illustrative cases:

Case 1.—A. C.; male, 3 years old. Beginning measles on admission. Nose and throat culture negative. Within 24 hours after admission had symptoms of membranous croup, which grew rapidly worse. Ten thousand units of antitoxin were given and a laryngeal culture taken. Notwithstanding the second culture was reported negative, the symptoms of croup were still present the next day, and another 10,000 units of antitoxin was given and another laryngeal culture taken. This culture was reported positive. Nine thousand more units of antitoxin were given before convalescence was fully established.

Case 2.—V. S.; female, 1 year and 6 months old. Faded measles rash on admission, together with clinical signs of nasal diphtheria. Nose and throat culture on admission negative. Nasal culture next day positive.

Case 3.—D. B.; female, 3 years old. Scarlet-fever measles on admission; also a serous bloody nasal discharge. Nose and throat culture negative on admission. Five days after admission clinical signs of membranous croup commenced. Laryngeal culture taken at this time was positive. Ran a very severe typical course of laryngeal diphtheria. Received 29,000 units antitoxin and recovered without intubation.

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[1] The diagnosis of positive culture was made on the morphological characteristics of the organism grown on Löffler's blood serum, using the classification of Wesbrook as the standard.

[2] See p. 90, second part of this report, for a more detailed discussion of the proper correlation of laboratory and clinical methods to prevent the spread of diphtheria in hospitals. The practical value of the Schick test is also discussed in detail on page 91.

Case 4.—G. F.; male, 1 year old. Faded measles rash and a slight nasal discharge on admission. Throat and nose culture negative. Five days later was transferred from isolation ward to general ward containing other convalescent patients. After transfer on the same day commenced to have a croupy cough, which remained about the same for three days, when it suddenly grew worse. Patient was removed from the ward to isolation room, antitoxin administered, and a laryngeal culture taken, which was positive for diphtheria bacillus. Ran a typical course of mild membranous croup, which responded well to a single dose of 10,000 units of antitoxin.

The rapidity with which diphtheria carriers may infect persons with whom they are thrown in contact was illustrated in a graphic manner by the further history of case No. 4. After he was removed to the convalescent measles ward he became the original source from which 13 other patients were accidentally infected. There were in all 17 exposures, 4 having remained unaffected.

The contact was both direct and indirect. The ward was ample and the ventilation good, but all patients were attended by three different nurses, who passed freely from bed to bed without change of gown or washing hands. Two ward maids did the same.[1] Besides the contact thus afforded, there was considerable running around the ward and passing from crib to crib by different convalescent children who were not kept in bed all the time. Case No. 4, however, did not leave its crib at any time, and was removed from the ward at the end of 72 hours, when it was first suspected of having diphtheria.

The following table shows the details of this exposure and also illustrates the manner in which positive and negative throat cultures may alternate from day to day in the same individual. The reliability of the Schick test as an indicator of susceptibility to diphtheria is also indicated.

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[1] The regular day nurse, who was thrown most intimately with these patients, never contracted the germ at all. The relief nurse became a transient carrier and developed a very mild sore throat. The night nurse became a carrier, but had no clinical symptoms. Neither one of the ward maids became infected.

TABLE 45.—*Spread of diphtheria bacilli in hospital wards.*

Hospital No.	Name.	Age in years.		Date of admission to hospital.	Throat culture on admission.	Date of first exposure.	Number of hours between first exposure and first positive culture.	Date of first positive culture.	Results of subsequent throat cultures.			
		Yr.	*mo.*									
865	G. F. case No. 4	1	0	Dec. 26	Negative	(1)	(1)	Jan. 3	Negative, Jan. 9	Positive, Jan. 10	Negative, Jan. 14	Negative, Jan. 15.
879	G. P	7	0	do	do	Dec. 31	72	do	Suspicious, Jan. 8.	Negative, Jan. 12	Negative, Jan. 13	
789	G. K	4	0	Dec. 14	do	do	72	do	Positive, Jan. 8	Negative, Jan. 11	Negative, Jan. 15	Negative, Jan. 19.
866	G. V	4	0	Dec. 26	do	do	72	do	Negative, Jan. 8	Positive, Jan. 9	Negative, Jan. 12	Negative, Jan. 13.
826	L. L	3	0	Dec. 19	do	do	72	do	do	Negative, Jan. 9		
857	M. A	1	8	Dec. 26	do	do	72	do	do	do	Suspicious, Jan. 12.	Positive, Jan. 13.
843	U. F	5	0	Dec. 21	do	do	96	Jan. 4	Positive, Jan. 8	Negative, Jan. 12	Suspicious, Jan. 13.	Negative, Jan. 15.
763	D. C	2	0	Dec. 7	do	do			Negative, Jan. 3	Negative, Jan. 4	Negative, Jan. 8	Negative, Jan. 9.
914	P. Z	7	0	Dec. 31	do	Jan. 1	96	Jan. 5	Positive, Jan. 8	Negative, Jan. 11	Negative, Jan. 12	Negative, Jan. 24.
905	G. D	9	0	Dec. 28	do	do			Negative, Jan. 3	Negative, Jan. 4	Negative, Jan. 5	Negative, Jan. 8.
922	E. K	1	6	Jan. 1	do	Jan. 2	144	Jan. 8	Jan. 11			
874	G. A	35	0	Dec. 26	do	do	48	Jan. 4	Negative, Jan. 5	Negative, Jan. 11	Negative, Jan. 12	
876	G. C	2	8	do	do	do	48	do	Negative, Jan. 8	do		
875	F. C	1	0	do	do	do	48	do	Negative, Jan. 10	Positive, Jan. 8	Positive, Jan. 9	Negative, Jan. 11.
877	S. C	5	0	do	do	do			Negative, Jan. 3	Negative, Jan. 4	Negative, Jan. 5	Negative, Jan. 8.
900	P. M	5	0	Dec. 28	do	do	24	Jan. 3	Positive, Jan. 8	Positive, Jan. 11	Negative, Jan. 21	Negative, Jan. 25.
913	O. B	3	0	Dec. 31	do	do			Negative, Jan. 3	Negative, Jan. 4	Negative, Jan. 5	Negative. Jan. 8.
924	V. F	3	0	Jan. 2	do	Jan. 3	32	Jan. 4	Negative, Jan. 8	Negative, Jan. 9	Positive, Jan. 10	Negative, Jan. 11.

[1] Unknown.

Hospital No.	Results of subsequent throat cultures.						Result of Schick test done Jan. 3.	Remarks.
865							Negative	No clinical signs of diphtheria.
879							do	Do.
789							do	Do.
866							do	Do.
826							do	Do.
857	Positive, Jan. 15	Negative, Jan. 24	Negative, Jan. 25	Negative, Jan. 26			do	Do.
843							do	Do.
763	Negative, Jan. 15						do	Never contracted the bacillus.
914	Negative, Jan. 25	Negative, Jan. 26					do	No clinical signs of diphtheria.
905	Negative, Jan. 9						do	Never contracted the bacillus.
922							do	Organism reported avirulent by laboratory.
874							do	No clinical signs of diphtheria.
876							do	Do.
875	Negative, Jan. 12						do	Do.
877	Negative, Jan. 11						do	Never contracted the disease.
900	Negative, Jan. 26						Positive	Afterwards developed a nasal discharge and broncho-pneumonia, both of which yielded promptly to antitoxin.
913	Negative, Jan. 9						Negative	Never contracted the bacillus.
924	Negative, Jan. 12	Positive, Jan. 15	Positive, Jan. 19	Negative, Jan. 24	Negative, Jan. 25	Negative, Jan. 26	do	Do.

Of seven patients exposed continuously to case No. 4 for 72 hours, the throat culture taken at the end of that time was positive in five. In the sixth it was positive at the expiration of another 24 hours of exposure to other positive cases, and in the seventh it remained constantly negative despite continuous exposure for two weeks.

Of seven patients exposed continuously to case No. 4 for 24 hours, one gave a positive culture at the end of that time, three were positive after the lapse of another 24 hours' exposure to other positive cases, two remained constantly negative despite two weeks' continuous exposure to other cases, and one gave the first positive culture only after five days' additional continuous exposure.

Of two patients exposed continuously to case No. 4 for 60 hours, both gave a negative culture at the end of that time and remained constantly negative notwithstanding continuous exposure to other positive cases for over two weeks.

One patient exposed continuously to case No. 4 for approximately eight hours gave a negative culture at the end of that time, but was positive after the lapse of 24 hours' additional exposure to other positive cases.

In seven instances exposure to the initial case had lasted 72 hours before the first culture was taken. As five of these were found to be positive, it is impossible to say that these five cases were not in reality harboring the diphtheria germ many hours before they were actually found. Such a supposition is rendered all the more plausible because of the fact that in five other cases where a daily culture was taken the period between exposure and the appearance of the diphtheria bacillus in the throat was in each instance less than 72 hours, and also by the fact that only three of the 13 positive cases required a longer exposure than three days before they began to yield positive cultures.

To summarize: Of 13 patients who contracted the diphtheria bacillus from a common source the number of days of constant exposure before the bacillus was recovered from the throat or nasal secretions was approximately as follows: One day, two cases; two days, three cases; three days or possibly less, five cases; four days, two cases; six days, one case. Four other patients exposed continuously to one or more positive diphtheria carriers for two weeks failed to show positive cultures from either nasal or throat secretions. Expressed in terms of liability to infection it can be said that 59 per cent of persons intimately associated with diphtheria carriers became in their turn carriers after two or three days of such association. A smaller number, 17 per cent, required a slightly longer contact before becoming carriers. A period of less than one week's intimate association sufficed for 76 per cent of all exposed to become carriers, whereas 24 per cent failed to harbor the bacillus even after two weeks of close contact.

Summary.—1. Diphtheria was slightly more prevalent during the fall and winter than at other seasons of the year.

2. The case fatality was two to three times greater during the colder months.

3. The case fatality was highest during the first three years of life.

4. After 8 years of age all cases recovered.

5. The high case fatality (25.7 per cent) was due chiefly to two factors—first, admissions late in the course of the disease, and, second, the tender age of the majority of the patients, nearly 70 per cent being less than 8 years old.

6. The case fatality of diphtheria, when it occurred as a cross infection, was twice as high as when it occurred alone.

7. Diphtheria carriers were very prevalent in the Ellis Island population.

8. The diphtheria bacillus, once introduced into a general ward, spread rapidly from person to person, infecting three-fourths of all exposed in a period varying from 24 hours to 6 days.

9. About one-fourth of the persons exposed failed to become carriers, even after two weeks' intimate association with those who harbored the bacillus.

10. The majority of those whose throat or nasal mucus membranes afforded a suitable nidus for the growth of the diphtheria germ gave a positive culture after less than three days' exposure to infection.

11. No cases with negative Schick test developed diphtheria.

WHOOPING COUGH.

There were 73 admissions for this disease. The case fatality was 9.5 per cent, but this varied from 0 per cent[1] in 1912 to 14 per cent in 1916.

Besides the 73 cases primarily admitted on account of whooping cough, 42 cases developed in measles and 4 in scarlet fever patients, making a total of 119 which were treated for this disease. The mortality in those cases which followed measles was 14 per cent. None of the cases following scarlet fever died.

All the deaths occurred in young children. Reference to the table on page 45 will show, however, that many patients 2 years old recovered, even when the disease was complicated by another infection. When death occurred it was always due to some complicating factor, such as broncho-pneumonia, gastrointestinal trouble, or a cross infection. The toxemia of the disease was never sufficient in itself to produce a fatal result.

From the standpoint of hospital management the most important question hinges upon the value of pertussis vaccine as a prophylactic and curative measure. The data which we obtained upon this point is very difficult properly to correlate and interpret. The extreme variability in the virulence, not only of different epidemics, but also of individual cases during the same epidemic, rendered it practically impossible to establish perfectly satisfactory controls for those cases which were treated with vaccine.

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[1] Eight cases.

The following cases were the only ones with the date of exposure definitely known in which vaccine therapy and prophylaxis were instituted. These were all convalescent measles cases and they were all in the same ward when the first case of whooping cough was recognized on May 31, 1915. The initial case was a boy 3 years old. The nurse first noted a cough on May 30. The next day he had two paroxysms of coughing accompanied with the characteristic whoop. He was removed from the ward on that day. He received pertussis vaccine as follows: June 1, 25 million; June 3, 100 million; June 6, 100 million. By the 13th of June all coughing had ceased.

About 10 days later three of the nine children in the ward from which the initial case was removed, were noted as having contracted hard coughs, and three others as coughing mildly.

Case 1.—Female, 1 year old. Had been coughing very hard since June 11. Was heard to whoop first on June 15 and again on the 16th and 19th. She received pertussis vaccine as follows: June 16, 25 million; June 17, 50 million; June 20, 25 million. She never whooped after the 19th and all cough had disappeared by the 25th.

Case 2.—Female, 4 years old; sister of case 1. Coughed first on June 16. She was given 25 million pertussis vaccine on that day. She never coughed after June 16 and the vaccine was not repeated. There was no characteristic whoop in this case.

Case 3.—Female, 3 years old. Cough first noted June 14. The nurse reported that the cough was paroxysmal in nature. On June 16 she had a severe paroxysm of coughing, followed by vomiting. She received pertussis vaccine as follows: June 16, 25 million; June 17, 50 million; June 20, 50 million. On the 19th her cough lost its paroxysmal character and the improvement was rapid from that time.

Case 4.—Female, 3 years old; sister of initial case. Had also been noted as having a slight cough since May 31, the same day her brother was recognized as having whooping cough. Her cough was never paroxysmal and she never whooped. On the 16th the cough had not changed its character, still remaining mild and loose. On account of fact of known exposure to whooping cough she was given 25 million pertussis vaccine on that date. Two days later, June 18, her already mild cough had undergone marked improvement. On June 19 it was necessary to discharge her for official reasons, and she passed from further observation.

Case 5.—Female, 6 years old. Attention was drawn to this child's cough mainly because of the fact that other children coughed harder than she, and that she had been suffering from a mild bronchitis ever since May 29, which had apparently grown neither worse nor better. She was given 25 million pertussis vaccine June 16. On June 19 her cough was noted as having undergone marked improvement. She was discharged for official reasons on that day and passed from further observation.

Case 6. Female, 3 years old; a sister of Case 5. Had also had a mild cough of the same nature as her sister's for practically the same length of time. She was given 25 million pertussis vaccine on June 16. Her cough showed improvement by the 19th, at which time she was discharged for official reasons and passed from further observation.

Case 7.—Female, 4 years old. Same exposure as preceding cases. Did not cough. Received 25 million pertussis vaccine June 16. Did not develop the disease.

Case 8.—Male, 6 years old; brother of cases 1 and 2. Same exposure as other cases. Did not cough at all. Received 25 million pertussis vaccine on June 16 and 50 million on the 20th. Did not develop the disease.

Case 9.—Female, 3 years old. Same exposure as other cases. Did not cough. Received 25 million pertussis vaccine on June 16 and 50 million on June 20. Did not develop the disease.

Although the evidence furnished by these cases is by no means conclusive, it certainly lends weight to the view that this method of treatment has in reality both prophylactic and curative value.

It was usually very difficult accurately to establish the duration of the cough because of the fact that it was impossible to obtain any accurate history of the illness. Even where the disease appeared to follow in the wake of a case of measles which had been under observation for some time, it was impossible to determine whether it in reality followed the measles or whether the measles for which the child had been admitted had simply interrupted for a time the natural course of a previously contracted whooping cough. In a few cases, however, it was possible to determine this point and to observe the influence of treatment upon the course of the disease. In the following tabulation the "duration" of the disease signifies the number of days between the first paroxysmal coughing spell and the last characteristic whoop:

TABLE 46.—*Durdtion of whooping cough when cases were treated symptomatically.*

Case No.	Complication.	Duration of disease.	Result.	Case No.	Complication.	Duration of disease.	Result.
		Days.				*Days.*	
50	Measles	19	Died.	36	Measles	11	Recovered.
40	do	17	Do.	43	do	42	Do.
42	do	5	Do.	45	do	48	Do.
4	Scarlet fever	28	Recovered.	60	do	56	Do.

Average duration of the recovered cases, 37 days.

TABLE 47.—*Duration of whooping cough when cases were treated with vaccine.*

Case No.	Complication.	Duration of disease.	Result.	Case No.	Complication.	Duration of disease.	Result.
		Days.				*Days.*	
47	Measles	51	Recovered.	65	Gonorrheal vaginitis	28	Recovered.
49	Otitis media	26	Do.	69	do	14	Do.
52	Measles	58	Do.	62	do	14	Do.
53	do	57	Do.	46	None	40	Do.
61	Chicken pox	27	Do.	48	do	24	Do.
63	Measles	39	Do.	59	do	10	Do.
64	do	9	Do.				

Average duration of cases, 30 days.

Summary.—1. The mortality from whooping cough was subject to marked variations.

2. The variable mortality depended chiefly upon, first, the incidence of cross infection as a complicating factor, and second, upon the age of the patient.

3. Deaths from whooping cough were all caused by some complication. Uncomplicated cases never proved fatal.

4. Specific vaccine treatment apparently had both prophylactic and curative value.

CEREBROSPINAL MENINGITIS.

The fatality for the whole series of 44 cases treated during five years was 34 per cent. These cases naturally grouped themselves into four epidemics separated by several months interval except the second and third, which occurred within less than three months of each other. That the third epidemic was in reality a continuation of the second is possible, although the long interval elapsing between the last case of the second and the first case of the third, together with the fact that there was no demonstrable link between the two, lends weight to the view that they were of separate origin.

The following tables give the details of age, sex, nativity, the time when serum treatment was instigated, and the results in each epidemic.

TABLE 48.—*Results of serum treatment in cerebrospinal meningitis.*

Epidemic.	Hospital number.	Age.	Sex.	Nationality.	Date of arrival at Ellis Island.	Date of admission to contagious-disease hospital.	Day of disease on which serum was first used.	Number of serum injections.	Result.	Remarks.
First [1]	397	*Months.* 10	Male	Sweden	Mar. 3, 1912	Mar. 3, 1912	Fifth	6	Recovered	
	404	11	do	British West Indies.	do	Mar. 10, 1912	Third	5	do	
	409	20	do	Greece	Mar. 15, 1912	Mar. 15, 1912		3	Died	Sick on board several days.
	410	20	do	do	do	do		1	do	Do.
	411	20	do	Turkey	do	do	First	2	Recovered	
	424	18	do	Greece	Mar. 19, 1912	Mar. 25, 1912	do	3	do	
	425	14	Female	Italy	Feb. 2, 1912	do	do	3	do	
	438	3	Male	Russia	Mar. 30, 1912	Mar. 31, 1912	do	4	do	
	443	11	do	Austria	Mar. 31, 1912	do	do	3	Died	
	533	23	Female	do	Apr. 26, 1912	Apr. 28, 1912	Third	2	do	
	489	16	Male	Greece	Apr. 18, 1912	Apr. 19, 1912	Second	3	Recovered	
	517	18	Female	do	do	Apr. 25, 1912	Third	4	do	
	496	19	Male	do	do	Apr. 23, 1912	First	6	do	
	530	13	do	Italy	Apr. 4, 1912	Apr. 27, 1912	Second	4	do	
	36	23	do	British West Indies.	July 5, 1912	July 10, 1912	do	8	Died	
	121	17	Female	Greece	Aug. 17, 1912	Aug. 30, 1912	First	7	Recovered	
Second [2]	841	18	Male	do	Apr. 17, 1913	Apr. 17, 1913	Third	7	Died	
	858	9	Female	Russia	Apr. 3, 1913	Apr. 19, 1913			do	Died immediately after admission to hospital.
	944	11	Male	do	Apr. 29, 1913	Apr. 30, 1913	First	2	do	
	1051	3	do	do	Apr. 26, 1913	May 10, 1913	do	5	Recovered	
	1080	32	do	Greece	Apr. 17, 1913	May 18 1913	do	4	do	
	1139	18	do	do	May 23, 1913	May 31, 1913		4	Died	Sick for several days before admission.
	1164	14	do	Italy	May 25, 1913	June 4, 1913			do	Died one-half hour after admission.
	238	18	do	British West Indies.	Aug. 16, 1913	Aug. 29, 1913	Second	1	do	Died in less than 24 hours after admission.
	253	2	Female	Austria	Sept. 9, 1913	Sept. 15, 1913	Fourth	8	Recovered	
	395	21	Male	Italy	Oct. 14, 1913	Oct. 23, 1913		4	Died	

[1] Cases, 16; deaths, 5; case fatality, 31 per cent.

[2] Cases, 10; deaths, 7; case fatality, 70 per cent.

TABLE 48.—*Results of serum treatment in cerebrospinal meningitis*—Continued.

Epidemic.	Hospital number.	Age.	Sex.	Nationality.	Date of arrival at Ellis Island.	Date of admission to contagious-disease hospital.	Day of disease on which serum was first used.	Number of serum injections.	Result.	Remarks.
		Months.								
Third [1]	824	15	Male	Greece	Dec. 26, 1913	Dec. 26, 1913		4	Recovered	
	831	16	do	do	Dec. 28, 1913	Jan. 1, 1914	Second	3	do	
	914	3	Female	Austria	Feb. 21, 1914	Feb. 22, 1914		4	do	
	974	20	do	Russia	Mar. 20, 1914	Mar. 21, 1914	Second	2	do	
	975	15	Male	Greece	Mar. 16, 1914	do	do	5	do	
	1007	50	do	do	Mar. 27, 1914	Apr. 4, 1914	First	3	do	
	1026	16	Female	Austria	Apr. 4, 1914	Apr. 12, 1914	Fourth	7	Died	
	1028	16	Male	Italy	Apr. 8, 1914	Apr. 15, 1914	First	2	Recovered	
	1124	18	Female	Greece	May 21, 1914	May 21, 1914	do	3	do	
	1192	17	Male	Italy	May 25, 1914	June 5, 1914	do	4	do	
	1207	17	do	do	June 2, 1914	June 12, 1914	do	2	do	
	1227	20	do	Greece	June 9, 1914	June 17, 1914	do	2	do	
	1236	16	do	Italy	do	June 20, 1914	do	2	do	
	1245	13	do	Greece	do	June 27, 1914	do	2	do	
Fourth [2]	1318	4	do	Italy	Feb. 25, 1916	Feb. 29, 1916	Second	19	Died	
	1328	2	Female	do	do	Mar. 6, 1916	Third	4	Recovered	
	1392	6	do	do	Mar. 9, 1916	Mar. 10, 1916	Second	1	Died	Died within 24 hours after admission.
	1400	8	do	do	do	do	do	5	Recovered	

[1] Cases, 14; deaths, 1; case fatality, 7 per cent.

[2] Cases, 4; deaths, 2; case fatality, 50 per cent.

Summary showing results of serum treatment in all cases.

	Number.	Recoveries.	Deaths.
Treatment instituted during the first 24 hours	18	17	1
Treatment instituted during the second 24 hours	10	6	4
Treatment instituted during the third 24 hours	5	3	2
Treatment instituted during the fourth day	2	1	1
Treatment instituted during the fifth day	1	1	0
Treatment instituted after the fifth day	3	0	3
Time of injection not definitely known, but presumably before the third day	3	3	0
Not injected—moribund on admission	2	0	2

Summary.—1. When the proper corrections are made for deaths which occurred within 24 hours after admission and for those cases in which serum treatment was instigated late in the course of the disease it will be seen that the greatest mortality occurred before the fifth year and between the sixteenth and twenty-fourth years, thus leaving the interval of late childhood comparatively free from danger. The series, however, is too small to warrant definite conclusions concerning the influence of age upon either the incidence or prognosis of the disease.

2. If one studies all four epidemics with relation to the time of their occurrence, it will be evident that they have all started in winter or early spring and reached their height in late spring or early summer. Seventy-nine and five-tenths per cent of all admissions for this disease were during the spring or early summer.

3. Complications in the course of the disease were not often factors of importance.

PART 2.

HOSPITAL ADMINISTRATION AND METHODS USED FOR THE CONTROL AND TREATMENT OF CONTAGIOUS DISEASES.

I. GENERAL RESULTS OF METHODS EMPLOYED AND FUNDAMENTAL PRINCIPLES WHICH GOVERN THEIR SUCCESSFUL APPLICATION.

Before describing the methods used for control of infections used it is pertinent briefly to invite attention to the general results obtained and to the fundamental principles which should govern the construction and management of hospitals devoted to the treatment of this class of diseases.

It is doubtful whether any contagious-disease hospital in the world is compelled to treat so many cross infections as that at Ellis Island. The reason for this lies in the fact that the steerage quarters of immigrant ships provide an ideal place for exposure to all the infectious diseases of children. This exposure is seldom limited to one disease alone. For example, during one voyage a child is often exposed to scarlet fever, measles, and whooping cough and arrives at Ellis Island in various stages of incubation of all three diseases. He may be admitted to hospital with a typical measles rash showing upon a skin which has already commenced to desquamate from scarlet fever and within 24 hours after admission he may have a positive diphtheria throat culture. Moreover, the same child may have a typical whooping cough develop before the measles for which he was originally admitted has entirely run its course. Such instances are by no means unique.

Of the 6,078 admissions to the hospital, 4,246 patients entered the contagious-disease wards. Of this number 654 were accompanied by a relative, which made the total number of individuals actually admitted to the contagious-disease wards 4,900. Of the total admissions to the contagious-disease wards, 565 were cases under observation on account of contact or suspected contact with contagious disease, but who recovered without developing any such disease. There were, therefore, 1,219 persons in the contagious-disease wards who did not have any contagious disease when admitted and who did not subsequently develop any such disease during their stay in the hospital.

Besides the 1,219 noncontagious cases admitted to the contagious-disease wards there were 1,178 admitted to other wards of the hospital for observation and treatment for such conditions as hookworm tuberculosis, trachoma, and favus. These were all treated by the same personnel as those in the contagious-disease wards. They were also served by the same laundry and kitchen. Although many of them were under observation for three weeks or longer none of the 1,178 contracted contagious disease while in the hospital.

Analysis of the tables already given and reference to the summaries under the headings of the different diseases will show that from the standpoint of hospital treatment the results have been fairly satisfactory, and that for the last two years of the five-year period the improvement in the death rate has been striking.

This improvement was not only noted in the deaths from all causes, but it was especially evident in the decreased mortality from measles and scarlet fever, which taken together comprised three-fourths of all the diseases treated.

Although the case fatality from measles during 1916 was 6.3 per cent, it must be remembered that hospital treatment of this disease has usually been attended by a much higher case fatality.

Reference to page 55 et seq. shows the distinct relationship which exists between isolation facilities and cross infections in measles and the improvement achieved by increasing the number of small units. The tables on page 44 et seq. include only the first secondary infection. There is no attempt made to tabulate succeeding cross infections. By these it was seen that 252, or 4.3 per cent, of the 6,078 patients admitted developed another contagious disease before being discharged from the hospital.[1]

An effort was made to determine how much of the cross infection was due to exposure before and how much after admission. There was a doubtful class in which it was not always possible to ascertain the exact time of infection. The result of this inquiry was as follows: Of 252 patients with cross infections, 138 contracted the second infection before admission, 83 contracted it afterwards, and in 31 the time was doubtful.

If we assume that the doubtful cases were equally divided between those who were exposed before and those who were exposed after admission, we have 99 cases or 2.3 per cent of the cases treated in the contagious wards who developed a second contagious disease from infection contracted after admission. According to the best information obtainable, this result compares favorably with that in similar institutions.[2]

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[1] This does not include 15 cases of gonorrhœal vaginitis, 10 of which were contracted in hospital, 2 before admission, and 3 with the time undetermined.

[2] A report made by Passed Asst. Surg. Marshall, U. S. Public Health Service, to the Surgeon General, concerning the methods in vogue at the Providence City Hospital, where all kinds of contagious diseases of children are treated either by the barrier or small isolation unit system, stated that out of 5,407 admissions for the five-year period 1910 to 1914 there were 119 cross infections. This result is practically identical with our own.

The important thing to note, however, is the marked diminution in this already low general average, which has taken place since the increase in isolation facilities in 1915. In the two years 1915 and 1916 out of 1,358 patients treated in the contagious-disease wards there were 91, or 6.7 per cent who developed another contagious disease. This was nearly 1 per cent higher than the average for the whole five-year period. Notwithstanding the increase in possible sources of infection, only 19 of the 91 cases, or 1.4 per cent of the total treated, contracted the second contagious disease after admission.

Not only have the number of cross infections decreased since the increase in isolation units, but there has also been a diminution in serious complications of other kinds. This has been especially noted in the gastrointestinal and lung complications of measles.

It must be borne in mind that the hospital was not originally designed to receive patients in small units, and that the adoption of this system has accordingly been greatly handicapped by the arrangement of the wards and buildings. This is especially apparent in the character of the service rooms in the wards, which while adequate for the needs of one large ward are entirely insufficient for the same space divided into several small units.

The low incidence of cross infection under circumstances which made it impossible always to carry out the proper technique of isolation and nursing, together with the fact that when cross infection did occur it could usually be traced to some specific break in technique which was unavoidable on account of limited facilities, leads to the belief that with a perfect arrangement of isolation units and service rooms a perfect technique of management could easily be evolved and cross infection be entirely dispensed with. The high case fatality of contagious diseases was seen to be in large part due to two factors. These were first, the fact that such a large number of the patients were in far advanced and neglected stages of the disease when admitted; and second, because of the prevalence of cross infection and complications.

It was conclusively demonstrated that cross infection contracted in hospital is avoidable, and there was abundant evidence to show that other complications decreased in direct proportion to the increase in number of isolation units. The admission of patients in late and neglected stages of disease was an evil inherent in the contingencies of an ocean voyage. This is largely unavoidable and is a condition which does not obtain in other hospitals for the treatment of this class of patients. When all these factors are duly weighed it is seen that the causes which have heretofore operated to make the case fatality of contagious diseases treated in hospitals higher than those treated in private practice are entirely preventable.

Moreover, it has been demonstrated that successful treatment in the same hospital of both communicable and noncommunicable diseases of children is not inherently inconsistent or impossible.

Before hospitalization of all the diseases of children is successfully undertaken in one institution, and before the recoveries from contagious diseases thus treated actually equal those which take place in private practice, certain fundamental principles governing the general plans of hospital construction and management must be borne in mind. The most important of these are as follows:

HOSPITAL CONSTRUCTION.

1. There should be no common admission room. Each unit should have all the appliances necessary for examination in the room where the patient is to remain.
2. There should be no common bathroom for newly admitted patients. Each unit should have running water and bathing facilities (not necessarily a tub) in the room where the patient is to remain.
3. There should be no large convalescent wards. No unit should be built to accommodate over five patients, and the most of them should hold only one bed. The units should be so constructed as to allow convalescent children to see each other without the possibility of direct contact.
4. It is not necessary to build expensive partitions between the different units. The cheapest kind of material for this purpose will answer all practical purposes. Neither is it necessary to have doors to every separate unit. A wooden gate will serve the purpose for most of the units. A certain number of units in each system can be built with partitions which do not reach the ceiling, thus reducing expense in construction and making the problem of ventilation easier.
5. Every system of units should have two entrances and be so constructed that infected material can be removed without contaminating the common corridor or service room.

MANAGEMENT.

1. A rigid technique of admission, examination, history taking, nursing, and discharge should be adopted and enforced in every detail.
2. Nurses' helpers or ward maids should have a special training in a school designed for the purpose before being employed upon wards where the special nursing technique is required.
3. Patients suffering from contagious disease should have more individual attention than generally prevails, and the nurses should be employed for eight-hour shifts. One nurse should not be expected to look after more than 6 acutely ill or 12 convalescent patients instead of twice that number, which is the custom in most hospitals.

4. There should be fewer routine or standing orders regarding treatment and more individual attention to the patients by the medical superintendents, than is the custom in most hospitals.

5. Laboratory reports should not be exclusively relied upon to determine the presence or absence of infections. There should be more intelligent cooperation between the men in charge of the patients and those in the laboratory than usually prevails. When at all feasible it would be better to have routine examination of throat cultures and vaginal smears made by the men who are actually treating the cases.

II. DESCRIPTION OF THE HOSPITAL AT ELLIS ISLAND.

GENERAL PLAN OF WARDS AND ADMINISTRATION BUILDINGS.

There are eight two-story buildings projecting at right angles from the main corridor which runs through the center. Four of these buildings have a northern and four a southern exposure. The space between the buildings is sufficient to secure good ventilation and plenty of sunlight, even in the buildings with northern exposure. There are two wards in each building, each 55 feet long by 27 feet wide. One of these wards is on the ground floor and one on the second floor.

If it were possible to utilize for ward purposes all the 14 wards in the eight buildings there would be capacity for 321 adult patients, or 364 children 3 to 4 years of age, or 560 children of less than 3 years. This estimate is based on an allowance of 45 square feet of floor space for each child 3 to 4 years of age, 65 square feet for children over 4, and 80 square feet for adults. The height of the walls is sufficient to give a cubic air space of over 1,000 feet per adult and a correspondingly liberal amount for children. With the usual distribution of adults and children the capacity of the 16 wards is about 400 beds.

Although there is theoretically accommodation for the above number of patients, the actual number which can be treated properly is less than half that number. The reason for this lies in the fact that the number of isolation rooms is inadequate. Fortunately there have seldom been over 150 patients in the hospital at any one time. Should it become necessary to accommodate more, all the wards on the ground floor could be cut up into cubicles, using the upper-story wards for convalescent patients only, and thus practically doubling the isolation facilities.

As the hospital is actually administered there are only eight wards in use for patients with contagious diseases.[1] These are situated at the western end of the central corridor. Two on the ground floor are cut up into small units which accommodate from three to five cribs each. There are 14 of these small units. In 1915 another ground-floor ward was cut up into 12 one-bed units (see Fig. No. 1, p. 82). Besides the small units, there is an isolation room capable of accommodating two patients in every one of the eight wards. There are, then, all told, 34 small units available, which are designed to accommodate from one to five patients, and four wards 55 by 27 feet, each one of which has a capacity of either 15 adults, 28 children 3 to 4 years old, or 33 infants.

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[1] This refers to the wards used for contagious disease proper, relatives accompanying children with such diseases, and patients admitted for observation on account of known or suspected contact with a contagious disease. It does not include three wards used for observation of tuberculosis patients and those suspected of having tuberculosis, nor one ward occasionally used to accommodate patients who are undergoing examination for intestinal parasites and trachoma.

As patients with different diseases are mixed together in the steerage and on landing, it becomes necessary to isolate practically every new admission for a more or less extended period of observation. Owing to the great prevalence of cross infections on arrival, and to the fact that a reliable history either of the present illness or previous infectious diseases is never obtainable from the immigrant, the above described isolation facilities, which at first glance appear unusually adequate, are as a matter of fact not sufficient for the proper sorting and grouping of 150 patients of the character usually admitted. However, since the 12 additional units were obtained by the subdivision of a large ward in 1915, it has been possible to inaugurate a uniform system of isolation which it has only occasionally been necessary to abandon. It is believed that were small units increased to the point where large convalescent wards could be totally dispensed with, the incidence of cross infection contracted in the hospital would practically cease.

THE SMALL UNIT.

Although these were primarily designed for one patient only, they are large enough to hold two beds if emergency arises which necessitates abandonment of the plan of strict isolation of each individual. When the rooms are thus utilized, care is taken to place children together who not only have the same diseases but who have been previously associated. Examples of such cases are those where two children of the same family are admitted to the hospital at about the same time and where a mother accompanies a nursing infant.

Each unit has running hot and cold water, a drop-light attachment so that examination of ear drums can be made in the room, a steam radiator, an indirect electric light in the ceiling which can be switched on or off by pressing a button just outside the room door, and a small shelf placed high above the washstand, entirely out of reach of any child. The furniture in the room consists solely of an iron bed or crib and a small low chair. Every morning a fresh paper bag is hung from the shelf by a small strip of adhesive plaster. This bag is to receive used dressings, antitoxin containers, throat swabs, and everything else which has been used in the room and which can be of no further service. The bags are collected daily and taken to a large incinerator where débris and garbage for the whole of Ellis Island are destroyed.

On the shelf are kept any special medicines or appliances needed for the individual case, a clinical thermometer, and a comb. A small chamber is kept under the bed.

A strip of clean white muslin, 18 inches wide, is tacked over the lower portion of the window frame to act as a wind shield and allow the window to be partly open for ventilation. A room thermometer hangs on the wall near the door in such a position that it can be read without entering the room. The temperature is kept at from 68 to 70° F.

There are 6 of these rooms in a row on each side of a common hallway. Each room has a door with a large glass window. The doors all open inward and are so arranged that no two are opposite each other. There is no attempt made to keep the doors closed except in special cases where it seems desirable to do so in order to insure absolute quiet for the patient. If a child is not sick enough to be kept in bed, he is prevented from leaving the room by placing a removable wooden gate in the doorway, which allows him to see out into the hallway through perpendicular slats.

There are large immovable glass windows in the partitions between the rooms, so that it is possible for the nurse to see the patients in six rooms at the same time. (See Fig. 1.) The beds are placed next to these partition windows and convalescent children soon commence to play with each other through these windows without the danger of any direct contact. Children in this system of small units are the happiest in the hospital. Experience has proven that there is more contentment where they can see each other and see what is going on around them without coming in actual contact than there is where they all mingle freely together in a common ward. As practically all quarrels among small children have their origin in the effort which one child makes forcibly to take away from another child some object which each desires for himself, the reason why more happiness exists here is apparent.

In the hallway between the two sets of isolation rooms are placed several basins containing 2 per cent creolin solution. These basins are used for washing the hands, and also for the immersion of instruments or utensils which have to be carried out of the room. Just outside every room hang three gowns and caps. One of these is for the doctor, one for the nurse, and one for the ward maid. Clean gowns are supplied daily.

This system of 12 rooms and a common hallway is served by one bathroom for bathing newly arrived patients and one bathroom with appliances for hydrotherapy. There is also a ward kitchen, a

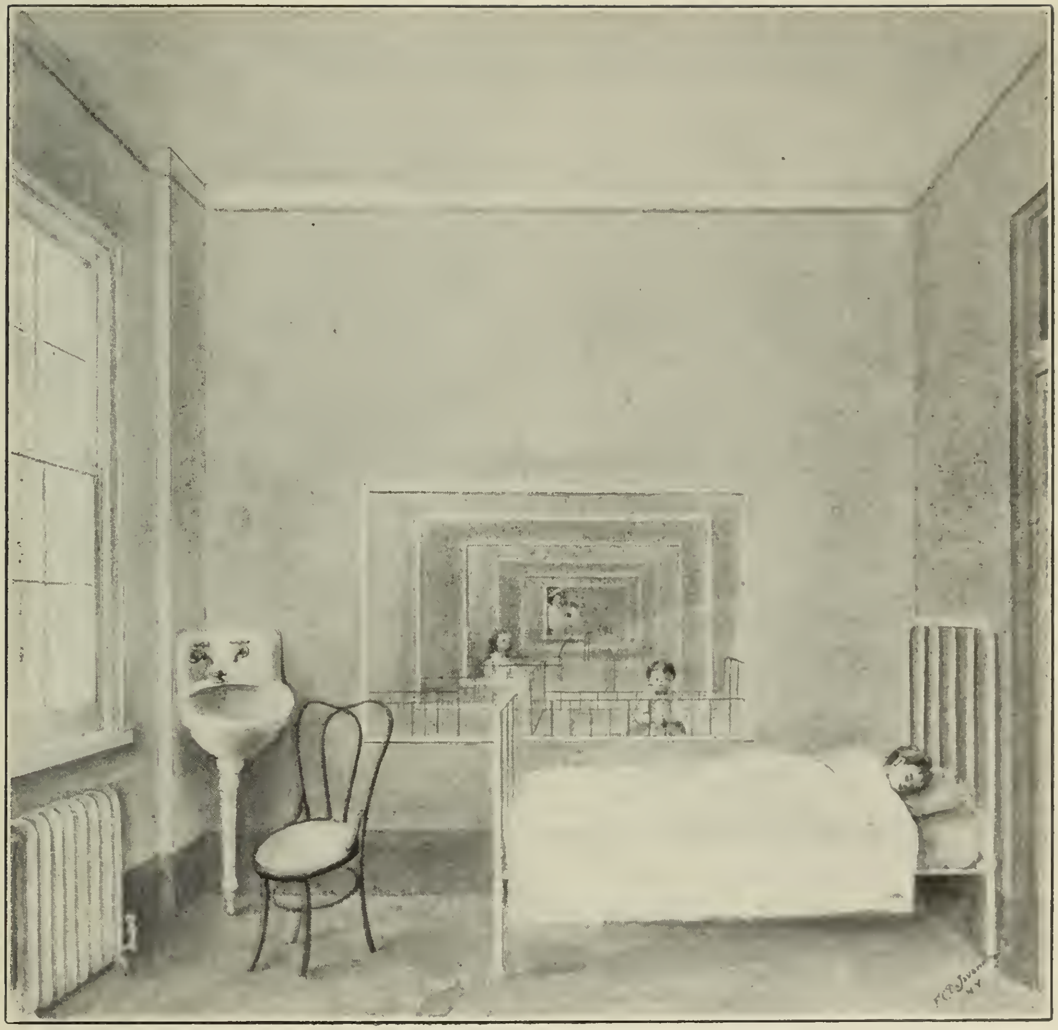

FIG. 1.—Small isolation units.

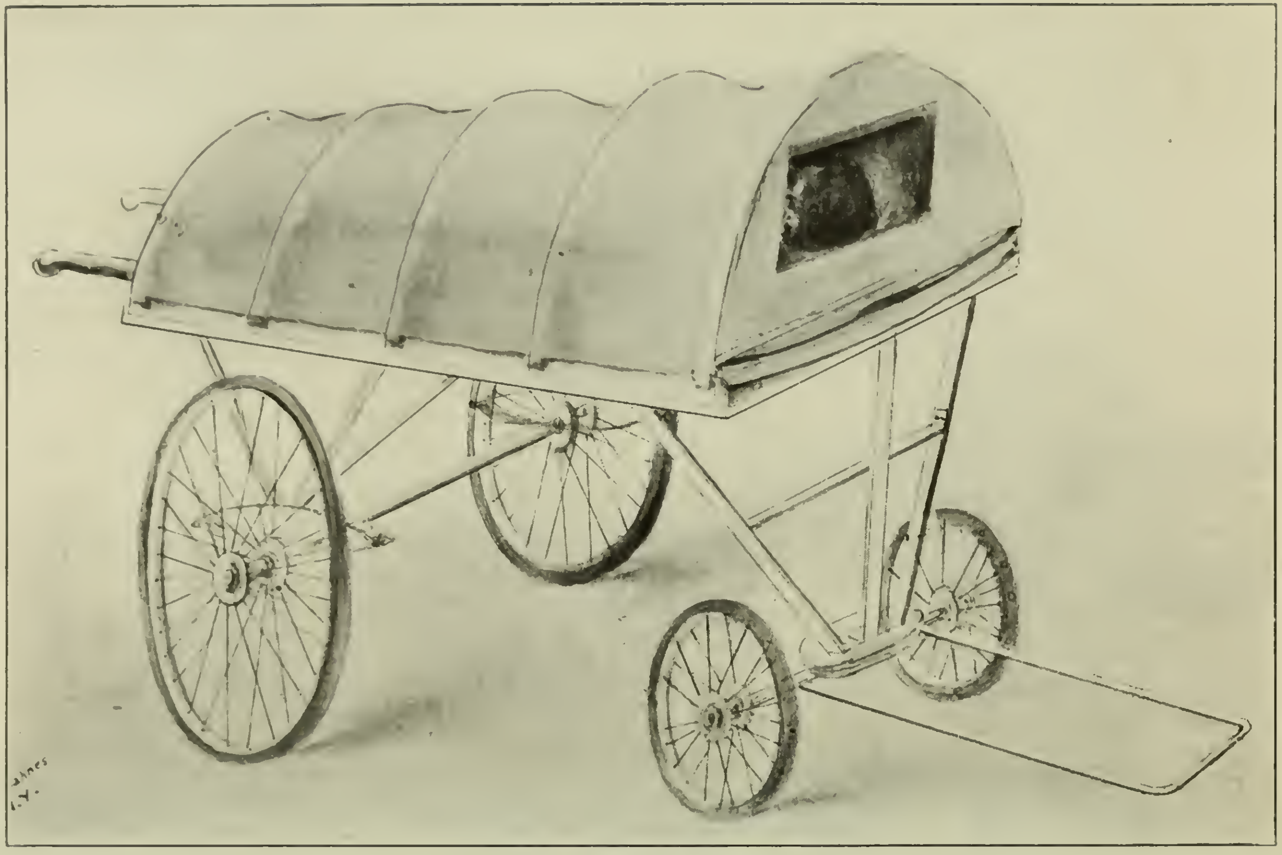

FIG. 2.—Hand ambulance.

linen room, a large toilet room, and a small sink closet. The nurse's office is a room situated in line with the isolation rooms on one side of the hallway, and through the inside window of this office she can see half of the whole system at one time.

The two other wards which are divided into small units of from three to five beds each are both arranged on the same general plan as the one just described. They differ, however, not only in the fact that the units are larger, but also in that they are not so well arranged as regards windows between the rooms and are not provided with such good facilities for bathing and hydrotherapy.

III. TECHNIQUE OF ADMISSION, EXAMINATION AND HISTORY TAKING, NURSING, AND DISCHARGE.

ADMISSION, EXAMINATION, AND HISTORY TAKING.

The patients are sent to the contagious disease hospital either from the detention rooms in the immigration administration building, the medical examination rooms, the primary medical inspection line in the same building, the general hospital, or direct from the immigrant barges.

These sources of admission are all from 150 to 300 yards distant and the transportation must be effected through passageways and over bridges exposed to the open air. To meet these conditions hand ambulances (see Fig. 2) have been devised. The prairie-schooner top can be removed entirely or in part as desired and the mica-glass window in the front end allows observation of the patient even when he is completely covered. The whole ambulance can be stripped of bedding and the framework and top washed down with the hose within five minutes.

When an ambulance call comes, a male attendant is sent to the sterilization room to dress the ambulance with sterile blankets and pillows. He first slips on a long white gown which completely covers his clothing. After preparing the ambulance he goes for the patient, which he brings to a small room at the west end of the corridor and notifies the admitting officer by telephone that a patient awaits his orders. The admitting officer informs him what isolation unit is ready to receive the patient. If there are no isolation rooms available the admitting officer goes immediately to see the patient, makes a diagnosis if possible, and assigns the patient to a ward or room with other patients where it is believed the danger of mutual cross infection will be the least.

As soon as the patient is taken to the ward the nurse in charge sees that he is placed in the bathroom, and she and the ward maid together undress him and list his clothes and valuables in the back of the admission sheet. All clothes are put in a bag, which is labeled with the patient's name and taken to the sterilizing room. Dirty underclothes are turned into the laundry from this room. All other clothes are put into the steam sterilizer. The child is now thoroughly bathed in the tub, and tincture of larkspur routinely applied to the head. After a bath he is dressed in clean night clothes and placed in his crib in the isolation room. As soon as the patient is in bed the nurse takes the pulse, temperature, and respiration, labels a Llofler's blood-serum tube with the patient's name, the date, and number of the ward, and in the case of little girls takes a vaginal smear. She now notifies the doctor in charge of the ward that a new patient is awaiting examination. The doctor makes this examination with as little delay as possible. He takes a nose and throat culture at the time of the examination, and this together with the vaginal smear is at once sent to the laboratory by the ward maid.

In the event that many patients are being admitted to the same ward at the same time or in rapid succession, they are put in their individual isolation units fully dressed, to await their turn in the bathroom. Between patients the bathroom is mopped out with hot water, and the tub scrubbed with 2 per cent creolin solution.

There is no effort made to confine the same diseases to the same wards. All are admitted indiscriminately to any ward, but are carefully kept from direct contact with each other by means of the isolation units already described. When it is necessary to place a new admission with other patients whose status as diphtheria carriers has not yet been determined, a Schick test is made, but antitoxin is never administered unless there is either clinical signs of diphtheria or known exposure to the same. Following is a specimen admission sheet filled out in the usual manner:

ADMISSION CHART.

U. S. Immigrant Hospital.

N. Y. Form 224, U. S. Department of Labor, Immigration Service.

(To be filled in by nurse)

Name, Guiseppa Catrona.

Age, 4 years; nativity, Italy; sex, female. No. 839.

Arrived July 9, 1915; admitted July 23, 1915; ex SS. Duca d'Aosta.

Manifest, not manifested; discharged, August 7, 1915. "Measles; recovered."

Cause of admission, observation on account of fever.

Bathed, tub; valuables taken up in ward, none except small metal cross with yellow metal chain attached.

Witnesses: Hanna Murphy (ward maid). Katherine Foran (nurse).

(To be filled in by the doctor.)

Condition on admission: Does not appear very sick. Looks like a case of beginning measles without complications. A few scattered rales over both lungs front and back. Heart, abdomen, extremities, lymphatic, and nervous systems all appear normal. Coughs some.

J. G. WILSON, *Surgeon.*

Preliminary medication, 15 c. c. castor oil.

Additional data for contagious disease hospital.

Location of relatives: Mother and sister in the excluded room in the main building.

Temperature, 38.2; pulse, 119; respiration, 29; scalp, pediculi; eyes, congested; nose, slight coryza; mouth, Koplik spots; throat, fauces red; ears, negative; skin, no rash nor desquamation; culture, nose and throat and vaginal smear all taken.

(To be filled in by nurse.)

Number of units antitoxin given by Dr. ...... (none given).
Admitted to ward B–1 by Dr. Wilson; date, July 23, 1915.
Transferred to ward B–2 by Dr. Wilson; date, August 1, 1915.
Discharged from ward B–2 by Dr. Wilson; date, August 7, 1915.

It will be noted that there are but few blank spaces to fill and that very little room is provided for recording results of examination. This is done purposely. It has been found desirable to have the positive findings stand out clearly in the record of the first examination. In order to accomplish this result these findings should not be mixed with other matter which, however interesting and scientific it may be, has no bearing on the management of the case in hospital.

In those instances where the physical findings warrant a longer record, a sheet of paper identical with that on which the nurses' notes are kept is used in addition to the admission sheet. The physician in charge of the case makes clinical notes as occasion warrants (usually not less than twice a week and sometimes twice daily), which show the condition of the patient and the progress of his disease. These notes are made on the same sheets that are used by the nurses for their daily and nightly records, and are dated and signed and placed in chronological order. The reports from the laboratory are also signed and arranged chronologically, so that one desiring to look up the medical history of a patient will find all the sheets for each patient arranged together and every note made by everyone who has had anything to do with the case, in exact chronological order from the time of admission to the date of discharge.

On the lower part of the admission sheet is a space for summarizing the record of the child's progress through the different wards of the hospital. This summary, together with the clinical notes and the nurses' bedside notes, both of which must invariably be signed by the person making them, serves to fix responsibility where it belongs, and thus acts as a direct stimulus to that precision of method which is essential to the proper hospital management of contagious diseases.

NURSING.

Only graduate nurses are employed. When a new nurse enters upon her duties she is first placed in a ward with one who has been already thoroughly trained in the technique of the place. The principle underlying the different rules is easily understood by any well trained nurse. It is briefly as follows:

Pay no attention to the possibility of infection by contaminated air, but always remember that any thing that has touched one patient must under no circumstances touch another patient till it has been properly disinfected.

It is the duty of the nurse in charge of the ward to drill this principle constantly into the minds of nurses and ward maids under her, and to watch vigilantly for any violation of it.

As the internal arrangement of all hospitals is by no means uniform, the specific rules for avoiding cross infection must also differ in order to meet the special requirements of each. This being so, it will be unnecessary to recount any rules in force which would not have a general application. The rules governing the technique of nursing, which are believed to have this general application, are as follows:

1. Never enter a room without putting on the cap and gown which hangs at the entrance of that room and which is to be used for no other room.

2. Never carry any instrument or utensil out of a room without first placing it in the 2 per cent creolin solution which stands in the hall at the entrance of each room.

3. When you leave a room take off the cap and gown and hang it on the hook at the entrance of the room, and then wash your hands in the creolin solution immediately.

4. Make the ward maids observe the above rules religiously. Watch them especially when they are feeding the children or giving them drinks of water to see that when they leave the room their hands are surgically clean and that they carry nothing infected with them.

5. Watch all visitors in the same way and make them carry out exactly the same technique as nurses and ward maids.

6. Observe exactly the same technique for rooms in your ward which contain patients with noncontagious disease as for those containing contagious diseases. The reason for this is that your example must be such that it will be above criticism at all times. If you allow your knowledge of the particular disease to influence your technique you run the risk of sometimes making a mistake which might prove disastrous. If you follow this technique without ever making exceptions it will become second nature to you and will soon be done without any conscious effort on your part.

7. Notify the doctor in charge of the ward immediately if you see the slightest deviation from the normal course of the disease. Pay especial attention to rises in temperature, the appearance of new rashes, or the presence of vaginal discharge.

8. Do not lend any instrument or utensil of any kind to be taken to another ward without express permission from the head nurse or the doctor in charge of the ward.

9. As soon as a patient is discharged, have all windows opened and the floor scrubbed, the bed stripped, and bedding wrapped up and sent to the sterilizing room. Every utensil and belonging of all kinds must be removed from the room in a way to cause no infection to other rooms, and the bedstead washed down with a 2 per cent creolin solution.

10. See that all creolin emulsions are made up so that they will be exactly of a 2 per cent strength, neither more nor less.

11. For the prevention of gonorrheal vulvo vaginitis the following specific rules are to be enforced:

Under no circumstances is a ward maid to handle a child with this disease. This applies to attention in the toilet and bathroom, as well as treatment.

Nurses will wear rubber gloves when administering treatments to these patients, also when changing their clothes and diapers, and in giving the baths. Patients with this disease must not be put in a bathtub used by others.

When ready to take off gloves, wash gloved hands first in soap and warm water, then in a 2 per cent creolin solution, and leave the gloves in the creolin solution, rinsing them off in plain water before putting them on again.

All clothes, diapers, pads, and everything that goes to the laundry must be allowed to soak in a 2 per cent creolin solution for at least three-fourths of an hour before being sent to the laundry.

Do not lend anything to anybody to take away from a ward where there are patients with this disease. This applies to everything in the ward, including materials in the ward kitchen, living room, and ward office, as well as in the isolation rooms.

On visiting days, before admitting any visitor be sure that the visitor does not have a permit to go to another ward. In the event of a visitor being permitted to visit more than one ward, the ones with vulvo vaginitis must be the last ones visited.

Finally, every new admission of any little girl for any cause whatever must be considered as a possible carrier of the infection and these two rules must be observed: First, the nurse and ward maid must carefully scrub hands with soap and water and use the antiseptic solution provided for the hands (2 per cent creolin solution) after bathing each new patient and before handling another patient, either new or old; second, after the ward maids are through handling the clothes and belongings of a new admission they must be required to thoroughly scrub their own hands with soap and water and use the creolin solution before they do anything else or perform any other duty.

It has been our experience that when isolation facilities are adequate and the foregoing rules are carried out the danger of cross infection is practically nil. It is not particularly difficult to find trained nurses who are willing to take the time and trouble to observe these precautions so far as they themselves are concerned. It is, however, a difficult matter to maintain an equal standard among ward maids, and a cross infection contracted in the hospital is probably nearly always due to a slip on the part of the latter.

Besides these specific rules, made especially to prevent cross infection, there are a few other practices which are believed to be of general application on account of the habit of precision which they breed in both doctors and nurses. Among these are the methods of prescribing and giving orders and the selection of the patient's diet.

In regard to the first the point of importance lies in the fact that it is understood by the nurses that they can not be held responsible for the execution of an order that has only been given verbally. Orders are written by the doctor in charge of the ward on the same sheet of paper as that on which the nurses' and doctors' notes are kept, and an order once given stands until it is stopped by another order, which must also be written. The nurse also writes down in her daily notes the fact that she has executed the order. There are no standing orders in regard to treatment except the one which requires the application of tincture of larkspur to the hair of all newly admitted children. The doctor in charge of the ward treats each case according to its individual necessities, and the idea that patients can be labeled and ticketed and treated in groups according to disease is discouraged.

The second practice which is believed to encourage precision is that of holding the doctor in charge strictly responsible for the kind of diet the patient shall have. Until a newly admitted patient is seen by the doctor it automatically goes on milk diet and remains on that diet indefinitely unless he writes a specific order to the contrary.

DISCHARGE.

Patients are kept in hospital not only until the danger of infection to others is passed but also as a general rule until recovery from all complications has occurred. The period of isolation conforms in a general way with that required by the sanitary code of the State of New York. Following are the minimum periods of isolation observed:

Chicken pox.—Until the crusts have fallen off and the scars completely healed.

Diphtheria.—Until two successive negative cultures have been obtained from the nose and throat at intervals of 24 hours.

Measles.—Until 10 days from the appearance of the first symptoms in mild uncomplicated cases. In other cases until all bronchitis and discharges from ear and nose have ceased.[1]

Mumps.—Until one week after the disappearance of the swelling.

Whooping cough.—Until one week after the disappearance of the characteristic whoop. If this has not disappeared in eight weeks patient is discharged anyway.

Scarlet fever.—In uncomplicated cases until desquamation has ceased, provided this is not over 30 days. At the end of 30 days from the appearance of symptoms all cases of scarlet fever are relieved from quarantine regardless of desquamation, provided they are not suffering from some suppurative complication. Suppurative ears and glands require isolation until recovery.

German measles.—Until the rash has entirely faded and the temperature reached normal.

Cerebrospinal meningitis.—Until one week after complete recovery, and until nasopharyngeal cultures are negative.

Gonovulvo vaginitis.—Until discharge has permanently ceased and until three successive smears at 24 hours intervals are negative.

Erysipelas.—Until all inflammation has left the affected part and all scaling of the skin is over.

Patients are made ready to go to the discharging ward some time during the day previous to their final dismissal from hospital. This getting ready consists in a thorough bichloride bath and hair washing, after which they are dressed in clean hospital clothes (underclothes, stockings, slippers, and blue gingham jumpers) and sent to the discharging ward. Early the next morning the maid assigned to this duty brings the patient's own clean clothes from the laundry and sterilizing room, dresses the child in them and takes it to the office, whence it is turned over to the chief clerk of the medical division, who in turn delivers it to the proper immigration authorities for final disposal. All temperatures are taken the morning of proposed discharge and if a child happens to be indisposed for any reason it is returned to isolation until the nature of its affection is discovered and recovery has again taken place.

IV. SPECIAL PROBLEMS CONNECTED WITH HOSPITAL MANAGEMENT OF CONTAGIOUS DISEASES.

We have thus far considered only those activities in management of the contagious diseases which are confined to the immediate surroundings of the patients themselves. There are other problems which are largely matters of general administration and concerning which there may well be honest differences of opinion. Some of these are purely medical questions connected with prevention and treatment, whereas others have to do with the methods of preventing infection through food and clothing.

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[1] Detention for longer than 10 days is in the interest of the patient and not because he is believed to be a source of infection to others.

The purely medical problems of general administrative interest are chiefly those which deal with the laboratory side of the hospital and with the value of certain procedures which require the cooperation and advice of the trained laboratory man.

There are also general policies to be determined concerning the matter of diet and the handling of food and infected clothing.

All these can best be considered by a description of the technique used to solve them under the following specific heads:

1. The practical value of routine throat cultures, antitoxin prophylaxis, and the Schick test.
2. The practical value of vaginal smears.
3. The practical value of vaccine therapy and prophylaxis.
4. The practical value of disinfectant solutions and fumigation.
5. Methods of handling food and dishes.
6. Methods of handling laundry.
7. Diet.
8. Visitors.

PRACTICAL VALUE OF ROUTINE THROAT CULTURES, ANTITOXIN PROPHYLAXIS, AND THE SCHICK TEST.

In the preceding pages of this report enough has been said to emphasize the extreme gravity of diphtheria, not only when it occurs as a primary cause of admission but especially when it occurs as a cross infection. This being the case, every possible means should be taken to prevent its contraction by patients not already afflicted.

During the first three years of the period under consideration it was the routine custom to take a throat culture and administer from 500 to 1,000 units of antitoxin to every newly admitted patient. In reviewing results at the end of that time it was seen that the antitoxin had apparently had but little prophylactic value. In those cases which had suffered from measles and scarlet fever the conclusion was inevitable that the protective value had been extremely short lived. The practice was accordingly discontinued. No increase in diphtheria followed. The practice in this respect at the present time is to take a nose and throat culture on admission, and if there is the slightest clinical evidence of diphtheritic infection to give immediately a full curative dose of antitoxin without waiting for the laboratory report of the culture.

The nose and throat culture is taken solely with the idea of obtaining aid to determine the proper distribution of patients in wards and isolation units, so that no diphtheria bacillus carrier may inadvertently be placed among others not thus infected. Neither the presence nor the absence of diphtheria bacilli is allowed to influence the giving or withholding of antitoxin. It has happened many times that first cultures have been negative where the clinical signs of diphtheria have been unmistakable. This has been especially true in the cases of laryngeal diphtheria which followed measles. In such cases the clinical diagnosis has often been confirmed by a positive culture occurring 24 to 48 hours after antitoxin has been given. On the other hand, a positive throat culture often occurred in patients with a very mild inflammation of the fauces accompanied by practically no constitutional symptoms. These mild cases of catarrhal diphtheria do not require antitoxin. In our opinion, the clinical symptoms should be the sole guide for the administration of curative doses of diphtheria antitoxin.

The value of the Schick test as a determiner of individual susceptibility is undoubted. In no instance have we seen a patient with a negative reaction contract the disease. In connection with this test, however, we noted two important facts which we believe may in certain instances greatly offset its practical value. These were, first, in children who were suffering from scarlet fever the reaction was often greatly delayed, not appearing for four or five days after the test was administered; and, second, even in those cases which reacted positively within the shortest length of time one could not be sure that the reaction was positive until 48 to 60 hours had elapsed. As the minimum period of incubation of diphtheria and the time required for a positive Schick test to manifest itself are practically the same, it follows that if a person happens to contract the infection the same day the test is performed a positive reaction may give no advance information in regard to his susceptibility.

If these limitations of the Schick test are kept in mind and for a period of five or six days after the test is made careful daily examinations of the nose and throat are made to determine the first clinical signs of diphtheritic infection, the test will be found a great aid in the management of those cases which must be treated in a common ward. It must be regarded as a procedure partially offsetting the disadvantage which accrues from inability to place each patient in a separate isolation room or cubicle until the result of exposure to infection is determined by accurate clinical observation.

PRACTICAL VALUE OF VAGINAL SMEARS.

Gonorrheal vaginitis was not often encountered among the patients. Prior to 1915 the records of the hospital show no primary admissions for this disease. Since that time there have been 8 such admissions, besides 15 secondary cases. These 23 cases all occurred during the spring and summer of 1915. Of the secondary cases 10 were contracted in the hospital. The extreme rapidity with which the infection spread and its great intractibility led to the adoption of the special rules mentioned on page 87. The routine taking of vaginal smears was also undertaken at that time and has been continued ever since.[1]

Experience with this epidemic led to the conclusion that we had to deal with the most highly contagious disease which had ever been admitted to the hospital. The practical value of taking vaginal smears was demonstrated, but it was observed that not much reliance could be placed upon a single negative smear as a diagnostic measure, and that positive smears from patients with little or no clinical symptoms usually indicated a subsiding infection with a comparatively low degree of ineffectivity. In other words, it was precisely those cases with pronounced clinical symptoms which appeared to be the most dangerous. Even the mildest cases, however, proved themselves sufficiently infectious to warrant every precaution which held out the slightest hope of aiding in the prevention of the disease.

Taking a vaginal smear from every little girl on admission is undoubtedly of great service in two ways. In the first place, it serves to help in the differential diagnosis of simple from nonspecific vaginitis, and, secondly, the very act of taking the smear compels a careful routine inspection of the parts for clinical signs of the disease. The nurses are taught that, in the presence of positive clinical signs, a single negative smear has no diagnostic significance, and that every patient with a vaginal discharge must be managed as a case of gonorrhea until repeated laboratory examinations have established beyond all peradventure of doubt that such precautions are not necessary. Vigilance is maintained not only on admission, but also during the whole period of the patient's stay in hospital.

The nurses are carefully instructed in the technique of taking smears and have standing orders to inspect the urethra and vulvar orifice of all small girls every day, and if there is the slightest evidence of discharge they are expected to send a smear to the laboratory and report the case to the doctor in charge of the ward immediately.

As a practical method to prevent the spread of gonorrheal vaginitis in hospital, the routine taking of vaginal smears has a similar value to the Schick test in the management of diphtheria. Both procedures are incomplete substitutes for individual isolation, which is the only safe method to keep infection from spreading from one patient to another.

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[1] During and shortly after this epidemic of gonorrheal vaginitis there were admitted eight cases in which the laboratory reports failed to establish the diagnosis of gonorrheal infection, and accordingly these were classified as simple vaginitis, although the same precautions were used in their treatment as in those positively known to be of a specific nature.

PRACTICAL VALUE OF VACCINE THERAPY AND PROPHYLAXIS.

This subject has an interest from the standpoint of general administration as well as in the treatment of individual cases. Any treatment which shortens the stay of a patient in hospital lessens the risk of cross infection and increases the efficiency of the management. Likewise any form of vaccination which will prevent the contraction of another disease to which the child may have been exposed also works to the same end.

To shorten the stay in hospital by the use of vaccine was found to be feasible in only one class of patients. These were the whooping-cough cases referred to on pages 69–72, where it was shown that the routine use of pertussis vaccine in exposed cases appeared either to modify the course of the disease or to entirely prevent its development, and also that in fully developed cases the average length of time in hospital was appreciably shortened by vaccine therapy.

An attempt was repeatedly made to shorten the stay in hospital by using autogenous vaccines in those patients who suffered from purulent otitis media. Recovery in a few instances appeared to be hastened, but the results were not sufficiently striking to warrant its adoption as a routine measure.

In the treatment of gonorrheal vaginitis no remedies employed influenced the course of the disease. Stock vaccines were used. They had no effect whatever so far as could be seen.

PRACTICAL VALUE OF DISINFECTANT SOLUTIONS AND FUMIGATION.

Disinfectant solutions.—Creolin emulsions of various strengths were used as hand disinfectants. For the last two years an emulsion of 2 per cent was uniformly employed.[1]

It is frequently said that immersion of hands into such a solution in the more or less perfunctory way in which it must necessarily be performed by a nurse who is busily engaged in the care of from 10 to 15 different patients at the same time has but little value. Our experience does not bear out this contention.

It is not claimed that hands can be thoroughly sterilized by such a procedure, but it is believed that the number of microorganisms is greatly reduced and the chances of infection correspondingly diminished. Each basin is provided with two clean towels, which are used until they become so wet that it is impossible to dry the hands on them any longer. The value of the damp towel is probably greater than that of the perfectly dry one, because it leaves the hands moistened with the antiseptic solution. This not only prolongs the time of contact with any microorganisms which may be on them, but also acts mechanically, tending to make them adhere rather than become easily dislodged, as would be the case were the hands perfectly dry.

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[1] Creolin was decided upon as the most practical disinfectant because of the fact that it seemed to be the one which the majority of the nurses could use constantly in strong solution without at the same time injuring the hands. Liquor cresolis compositus, U. S. P., in 1 per cent solution has been used since February, 1917. The practical results of this have not yet been determined.

The following experiments were conducted in order to determine the extent of disinfection actually accomplished by the method of hand washing in daily use upon the wards.

An agar plate was planted with the infection from the fore and middle fingers of one hand which had been contaminated by rubbing over the surface of an old culture of mixed bacteria. The infected fingers were rubbed lightly over the surface of the media. The fingers were again infected with the culture and the hands washed for about 30 seconds in a 2 per cent creolin solution and dried on an ordinary towel, after which another agar plate was treated in the same way. Both plates were incubated at 37 degrees for 20 hours. At the end of that time the first plate showed a solid growth in the tracks made by the contaminated fingers, whereas the second showed only 10 small discrete colonies on its surface.

A second test made at the same time consisted of infecting one agar plate with fingers that had simply been rubbed over the surface of the experimenter's clothes, and another plate with fingers contaminated in the same way but afterwards washed for 30 seconds in 2 per cent creolin solution and dried on an ordinary towel. After incubation at 37 degrees for 20 hours the first plate showed 62 and the second 4 colonies.

In order to determine, if possible, whether there was any special virtue in the antiseptic solution or whether the diminution in colonies was due solely to the mechanical cleansing, another experiment was conducted, as follows:

Forty-two agar plates were infected by the hands of six different persons in four different ways, viz: (1) After rubbing over the clothes of the experimenter the forefinger was rubbed lightly over the surface of the plate. (2) After infection as in (1) the hands were washed in plain soap and water for about 30 seconds and wiped on a clean dry towel, and the agar plate then rubbed lightly with the forefinger. (3) The same process was repeated after washing the hands in a 2 per cent creolin solution for about 30 seconds and drying them with an ordinary dry towel. (4) The same process was repeated after treating the hands with 2 per cent creolin solution for about 30 seconds and drying them with a towel moistened in the same solution.

In two instances the growth noted on the plates after 24 hours, incubation was greater after the soap and water cleansing than it was when the hands had not been cleaned at all. Taking a count of the colonies on all the plates it was found that the average proportion was approximately as follows: Five times as many colonies after using soap and water as after using the 2 per cent creolin and dry towel, two times as many colonies after using 2 per cent creolin and dry towel as after using 2 per cent creolin and damp towel.

Although not completely proven, the obvious inference from the above experiments is that perfunctory washing of hands in a basin of soap and water has little if any value as a means of preventing infection. In fact, it would seem that unless it were running water the procedure may leave the hands more infected than if they were not cleaned at all. It also seems clear that even a perfunctory washing in 2 per cent creolin diminishes the sum total of chances of infection.

Although disinfectant solutions find their chief use as hand cleansers, they are also employed freely as follows: Crude carbolic or creolin solutions are used for the purpose of washing out bathtubs, cleaning bedsteads after rooms are vacated, and cleaning toilet seats. Infected clothes which can not be immediately removed to laundry or sterilizer are also placed in these solutions. Dishes and cups and all utensils taken from isolation rooms are placed in creolin solution in the hallway before they are taken to the ward kitchen or any other part of the ward.

Fumigation.—Terminal fumigation of rooms and wards was practiced routinely until the summer of 1914, when it was abandoned and the process of cleaning described on page 87 substituted. There has never been a case of cross infection traceable to room contamination either before or after the abandonment of the practice of terminal fumigation. On general principles rooms recently vacated are left unoccupied as long as possible, although in case of necessity there is no hesitancy in using them immediately after the mechanical cleansing.

Sterilization of patients' clothes is routinely practiced. Likewise all bedding and visitors' gowns are sterilized. This is done every day in a large steam sterilizer, which allows the introduction of formaldehyde gas if desired.

METHOD OF HANDLING FOOD AND DISHES.

All food is distributed from a central kitchen. All cooking is done in this kitchen, not only for the patients but also for the personnel of the whole hospital. Specially prepared foods and modified milk formulas are prepared in the ward kitchens by the nurse in charge of the ward.

The food is brought from the kitchen by male attendants who deliver it to the ward maid from large containers at the door of each ward. Each ward has its own dishes which do not leave the ward under any circumstances. They are washed in the ward kitchen after having been put in a creolin solution which stands at the door of each unit. The object is not only to prevent infection from the ward to the central kitchen, but also to keep the individual ward kitchens free from danger.

METHODS OF HANDLING LAUNDRY.

As soon as a patient is admitted his clothing is taken to the sterilizing room adjoining the laundry. It is here sorted by the laundry force, underclothing being placed in the wash and all other clothing sterilized.

Each ward has its daily laundry listed and put in a separate bag by the ward maid ready for collection every morning by a male attendant detailed to handle soiled linen. Washing is done every morning and the clothes returned to their proper wards at 4 o'clock in the afternoon, where they are counted and the lists checked up by the ward maid under the nurse's supervision. The clean linen is placed in the locker room. No one is allowed to touch anything in this room unless the hands have been previously cleansed in 2 per cent creolin solution.

In the laundry the clothes are put through the following processes in the order named. These processes not only thoroughly clean the clothes, but also render them practically sterile.

1. Placed in the wash wheel (the wheel is a washing machine of standard make, similar to that in use in all steam laundries) and rinsed in cold water for five minutes by constant turning of the wheel.
2. Cold water run off and hot soapsuds solution applied for five minutes, the wheel constantly revolving.
3. Hot soapsuds solution run off and a fresh soapsuds solution to which a "bleaching solution" has been added is now run into the machine.[1]
4. Steam is turned into wheel and the clothes are subjected to the hot soapsuds and steam plus the "bleach" for one-half hour, during which time they are kept in constant motion by the revolutions of the wheel. The temperature of the solution is kept at 180 to 200 degrees Fahrenheit.
5. At expiration of one-half hour the hot soapsuds is run off and the clothes are rinsed in clear hot water for five minutes.
6. The hot rinse is now replaced by two cold rinses, each of five minutes duration.
7. Clothes are now removed to an extractor, where the greater part of the water is removed by centrifugal force.
8. All flat work is dried and pressed by running through the mangles.
9. Underclothing and night clothes are dried "rough" by placing in hot-air closets until completely dry.

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[1] The bleaching solution is made as follows: 1 pound chloride of lime and 5 pounds washing soda to 5 gallons of water. One pint of this solution is added to each 25 to 30 gallons of the soapsuds solution.

DIET.

On admission all patients are put routinely on milk diet. This is not changed until so ordered by the doctor in charge of the ward. He is expected to watch the progress of the disease and pay special attention to the dietetic requirements of each individual case. The following are the diets used in the contagious disease wards:

1. *Milk diet.*—Milk every two hours during the day and every four hours at night. The amount will vary with the age of the patient, but except in the case of very young will be from 6 to 8 ounces at each feeding.
2. *Modified milk diet.*—This will vary with the individual case. Milk will be withdrawn altogether and its place taken by gruels, albumin water, or beef juice, or it will be given diluted with gruels or water. In some cases special prepared foods will be given, but in every case when modified milk diet is prescribed the physician will indicate exactly the modification required and give specific directions for the preparation and administration of the food.
3. *Light diet.*—Breakfast consisting of milk, bread, a cereal, and soft-boiled eggs. Dinner consisting of eggs, bread, milk, soup, and some stewed fruit. Supper consisting of milk and bread. All patients on this diet have milk offered them between meal hours, about 10 o'clock in the morning and at 3 o'clock in the afternoon.
4. *Regular diet.*—The same as light diet with the addition of meat or fish, and desserts and tea or coffee.
5. *Special diet.*—Each item to be ordered by the physician.

Patients with nephritis are not all put routinely upon milk diet. Some are allowed carbohydrate food in addition.

After a great deal of experimentation with milk formulas for bottle-fed infants the plan adopted in the hospitals of the Panama Canal Zone was finally agreed upon as the most uniformly satisfactory. This consists of a formula made with unsweetened and sweetened condensed milks in certain definite proportions. The children not only like the milk prepared in this way, but they seem to do better on it than on any other modification so far devised. The following directions are pasted in the nurse's office in each ward and the formulas are prepared strictly in accordance with them:

TABLE 47.—*Directions for feeding infants.*[1]

Age.	Formulas.			Feedings.					
	Sweetened condensed milks.[2]	Unsweetened condensed milks.[3]	The diluent boiled water barley, or oatmeal water.	Amount.[4]	Interval.[4]	Number of feedings daily.[4]	Diluent.	Extras.	
								To each bottle.	Daily, 15 to 30 minutes before the first bottle.
				Ounces.	*Hours.*				
1 day	One-half ounce of boiled water every 3 or 4 hours.					3			
2 days	1	3	60	½	2	8	Boiled water	1 to 2 teaspoonfuls of lime water. If constipation is present, ¼ teaspoonful of milk of magnesia instead of lime water.	
3 days	1	3	50	1	2	8	do	do	
4 days	1	3	40	1	2	8	do	do	
5 days	1	3	30	1	2	8–10	do	do	
6 days	1	3	24	1	2	8–10	do	do	
7 days	1	3	20	1½	2	8–10	do	do	
1 to 4 weeks	1	3	16	2	2	8	do	do	
1 to 3 months	1	3	16	3– 4	2½	7– 8	do	do	
3 to 6 months	1	3	12	5– 7	3	7	do	do	10 to 15 drops of orange juice.
6 to 9 months	1	3	12	7– 9	3½	6	Barley water	do	1 to 2 teaspoonfuls of orange juice.
9 to 12 months	1	3	12	8–10	4	5	Barley water or oatmeal water.	do	2 to 4 teaspoonfuls of orange juice.
12 to 15 months	1	3	12	8–10	4	5	do	do	1 to 2 ounces of orange juice and 1 egg, with toast or cracker and butter.
15 to 18 months	1	3	12	8–10	5	4	do	do	1 to 2 ounces of orange juice and 2 eggs, with toast or cracker and butter.
18 to 24 months	0	1	2	8–10	5	4	do	do	Light general diet.

[1] These formulas are used in the Panama Canal hospitals and are published by the Panama Canal health department.

[2] This column refers to sweetened condensed milks, such as Nestle's Condensed Swiss Milk prepared in Switzerland or England, or the Milkmaid brand.

[3] This column refers to unsweetened condensed milks, such as Nestle's Unsweetened Milk, St. Charles' Unsweetened Evaporated Milk, Libby's Unsweetened Sterilized Evaporated Milk, Borden's Condensed Milk, Peerless brand.

[4] Intervals between feedings should be lengthened and amounts correspondingly increased in the case of strong healthy infants.

NOTES.—(*a*) Always use boiling water in preparing the milk.

(*b*) Enough can be prepared in the morning for the whole day's feedings, if enough feeding bottles are provided for the number of daily feedings, all filled when prepared, and corked with clean corks or sterile cotton plugs.

(*c*) When not in use keep the rubber nipples in a solution of boracic acid, 10 grains to the ounce.

(*d*) After use thoroughly cleanse the bottles with cold water; before refilling cleanse with boiling water.

(*e*) Add a few grains of table salt to each feeding.

(*f*) If vomiting occurs use a weaker formula.

(*g*) Always add the lime water just before feeding.

How to prepare a day's feeding of 1—3—20:

Twelve ounces are necessary for the whole day. Take one-half ounce of sweet condensed milk, add about 6 ounces of boiling water, dissolve thoroughly, then add 1½ ounces of unsweetened condensed milk, mix and add enough boiling water to make 12 ounces. Pour 1½ ounces in each of eight feeding bottles, cork properly and, just before feeding, add one teaspoonful of lime water or milk of magnesia to each bottle.

How to prepare 48 ounces of 1—3—12, or 6 feedings of 8 ounces each:

The same as above, only use 3 ounces of sweet condensed milk, 9 ounces of unsweetened condensed milk, and 36 ounces of boiling water.

Always remember to taste the unsweetened condensed milk when the can is opened, and if it is curdled or sour do not use it.

Always remember that cleanliness in the preparation of this milk, and also of the bottles and nipples, is absolutely necessary.

VISITORS.

Visiting is allowed once a week or more frequently if the patient is not expected to recover. It is confined, however, strictly to the parents or nearest relative of the patient.

The time of the visit is short, not being allowed to exceed 15 minutes, except in special cases. Visitors are not allowed to go to the wards till they have been provided with freshly sterilized gowns and caps. They procure these from the sterilizing room and put them on under the direction of an attendant, who then takes them to the ward they are to visit. (See Fig. 3.) Here the nurse in charge keeps them under her constant supervision and does not allow them to leave the ward without a thorough hand washing in the creolin solution.

Even with the foregoing precautions visitors are a constant source of danger. They do not understand the principles that underlie the rules and therefore require the most careful watching to prevent them from inadvertently carrying infection from one patient to another. Besides the dangers accruing from the breaking down of technique there is the added disadvantage that the condition of children nearly always becomes worse after a visit from parents. Usually this does not amount to anything except a slight increase in nervousness and perhaps a transient rise in temperature, but sometimes it occasions a setback of a more serious nature. If the purely medical aspects of the case were the only ones to consider, there can be no doubt but contagious-disease hospitals could be run much more efficiently were visiting disallowed altogether, except in those cases where it was evident that the patient had but little or no chance of recovery.

CONCLUSIONS.

I. The statistical data set forth in the first part of this report are so arranged that they are available for the use of persons interested in the clinical aspects of the various diseases considered, and can be applied by them as best suits their individual needs. In many instances the number of cases tabulated is too small to warrant the drawing of general conclusions, but these cases have, nevertheless, been included so that they may be available in the compilation of larger statistics by others. In other instances the data have seemed to be sufficient to warrant the expression of a general conclusion. Such conclusions will be found in the summaries following the individual tables.

II. The main conclusion to be drawn from our experience as set forth in the second part of this report is the practicability of treating contagious and noncontagious diseases in the same hospital and with the same nursing force. While it is not advisable to use the same open wards for both classes of cases, it has, nevertheless, been dem-

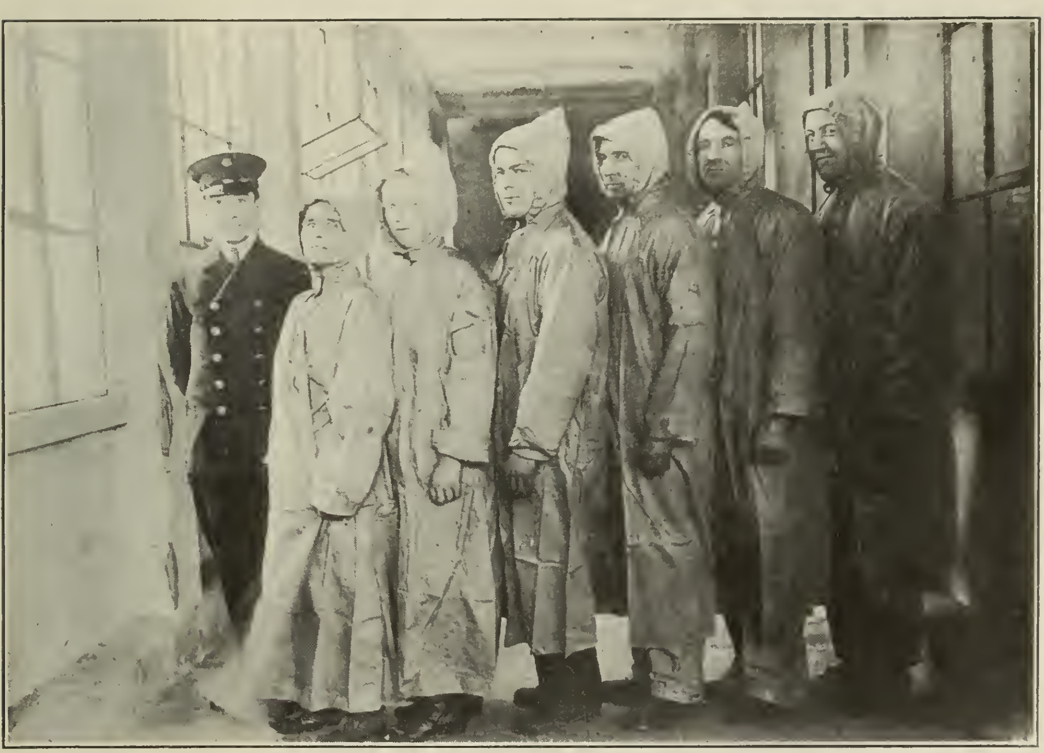

FIG. 3.—Visitors gowned preparatory to entering wards.

onstrated that if these wards are cut up into small cubicles and the proper nursing technique enforced there is practically no danger of cross infection. As a natural corollary to this method, it would follow that all general hospitals should have provisions for treating cases by the cubicle system and thus be prepared to receive contagious cases in emergency. It would also follow that small communities which can not afford both a general and an isolation hospital should plan their general hospital and its management so that contagious diseases might be received as freely as noncontagious.

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